The Welding Engineer

Reg. U. S. Pat. Office

Founded by L. B. Mackenzie, 1916

NOVEMBER, 1927 — VOL. 12, No. 11

$3.00 per year in U. S. — 608 S. Dearborn St., Chicago, Ill. — $4.00 per year abroad

Rapid, Strong *and* Economical

TOBIN BRONZE welds can be made on cast-iron without extensive pre-heating and in most cases without dismantling. The low welding temperature required (1650°F.) obviates shrinkage and distortion, thus permitting accurate alignment of the welded parts.

Tobin Bronze welds are strong. The bronze permeates the cast-iron and the resulting bond is stronger than the casting itself. Because they save time and labor, Tobin Bronze Rods are the most economical for welding cast-iron by the oxy-acetylene process.

Tobin Bronze, a special alloy made exclusively by The American Brass Company, may be obtained from leading distributors of welding supplies. Look for the name "Tobin Bronze" stamped in every rod.

THE AMERICAN BRASS COMPANY

GENERAL OFFICES: WATERBURY, CONNECTICUT

Offices and Agencies in Principal Cities

Canadian Mill: ANACONDA AMERICAN BRASS LIMITED

New Toronto, Ontario

TOBIN BRONZE

REG. U.S. PAT. OFF.

WELDING RODS

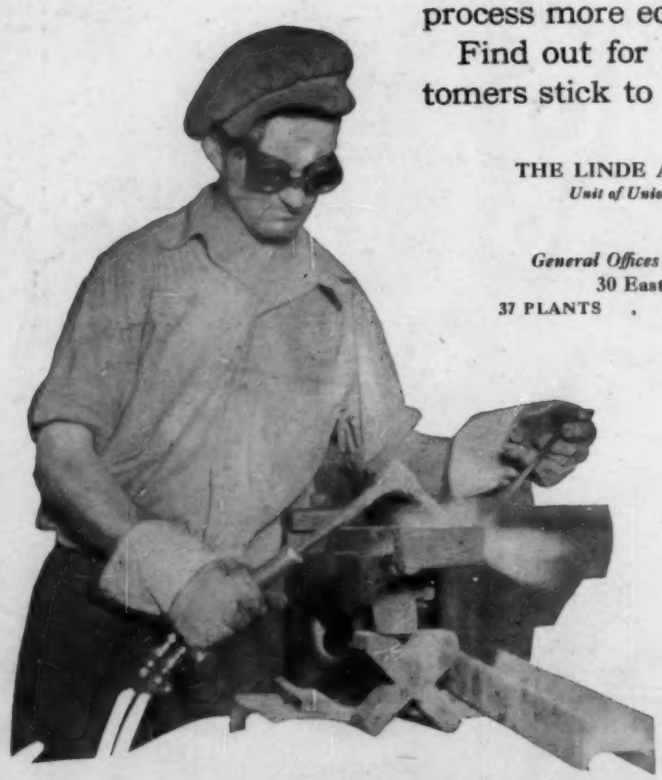
Published monthly by the Welding Engineer Publishing Co. Entered as second class matter Jan. 20, 1916, at the Post Office at Chicago, Ill. Under the Act of March 3, 1897.

Linde wants YOU as a customer

WHETHER you are a large or small user of oxygen, whether your plant is in Maine or California, Linde wants you for a customer.

Linde process service can help you as a small user with the practical application of the oxy-acetylene process. It can help you as a large user to work out new processes of manufacture and to determine just how you can use the oxy-acetylene process more economically.

Find out for yourself why Linde customers stick to Linde.



THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation

UCC

General Offices: Carbide and Carbon Building
30 East 42d Street, New York
37 PLANTS . . . . . 107 WAREHOUSES

LINDE OXYGEN

Oxyacetylene Welding Repaired This Cast Iron Gear With Airco-Davis-Bournonville Apparatus, Airco Oxygen, Airco Acetylene, and the Airco Service That Is Available To All Airco Customers

A four-ton gear with 18-in. face, 3-in. thick; 10-ft. diameter; two sections broken out of face, one 2-ft. long, the other 3-ft. long; one spoke broken close to hub, two spokes cracked close to face. Obsolete pattern and replacement only at great cost for new pattern, casting, and resulting delay. Reclaimed by oxyacetylene welding, two welders, and at times three helpers feeding added metal. Only the sturdiest torches could stand up on such heavy welding. Airco-Davis-Bournonville Style 7700 torches were used constantly, with Airco gases and Airco-D-B welding rods.

It is such performance that ensures reliance upon Airco products and Airco service to Airco customers, available from 64 Airco plants, 110 distributing points and 20 district offices.

One of the broken sections prepared for welding

Welding section of broken 18-inch rim

THIS TAG IS ON EVERY AIRCO OXYGEN CYLINDER

Buy Your Oxygen On Specification For Purity

AIRCO OXYGEN IS 99.5% PURE IN THE CYLINDER

The Purest Oxygen Is Always the Most Economical

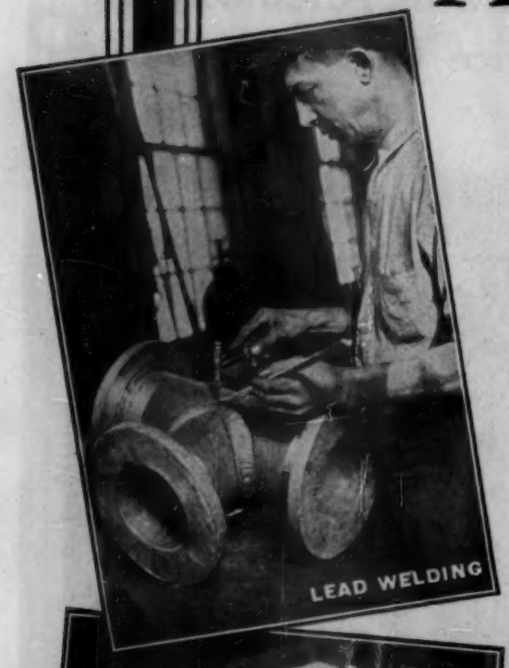
AIR REDUCTION SALES COMPANY

District Offices

Baltimore, Birmingham, Boston, Buffalo, Chicago, Cleveland, Dayton, Detroit, Emeryville, Calif., Jersey City, Los Angeles, Milwaukee, Minneapolis, Oklahoma City, Philadelphia, Pittsburgh, Richmond, Seattle, St. Louis, Wheeling

Home Office 342 Madison Ave., New York City, N. Y.

Acetylene—
the universal gas



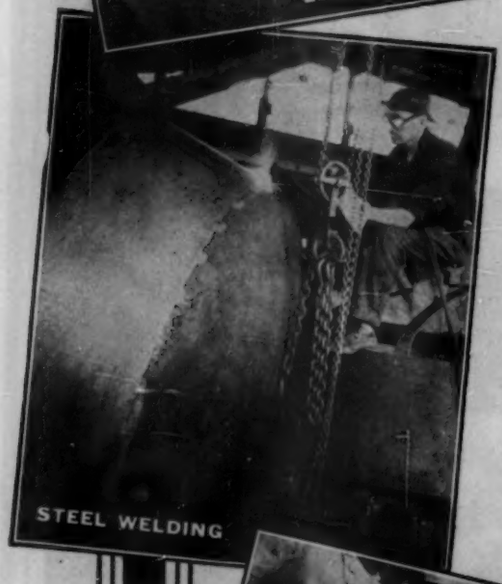
OCCASIONALLY one hears of a gas other than acetylene that can be used with oxygen for cutting steel.

The promoters of such gases readily admit that acetylene is the best for all other uses with oxygen.

That's why acetylene can be called the universal gas for all oxy-acetylene welding and cutting. It can be used equally well for welding thick or thin plates of metal. It is the most satisfactory for cutting steel or cast iron, and also for brazing, welding and soldering.

In fact, the very term—*oxy-acetylene* process—itself is a good indication of the fact that acetylene is the "universal" gas.

The Prest-O-Lite Company has 31 plants in operation and 101 distributing points for supplying users of this universal gas.



THE PREST-O-LITE COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
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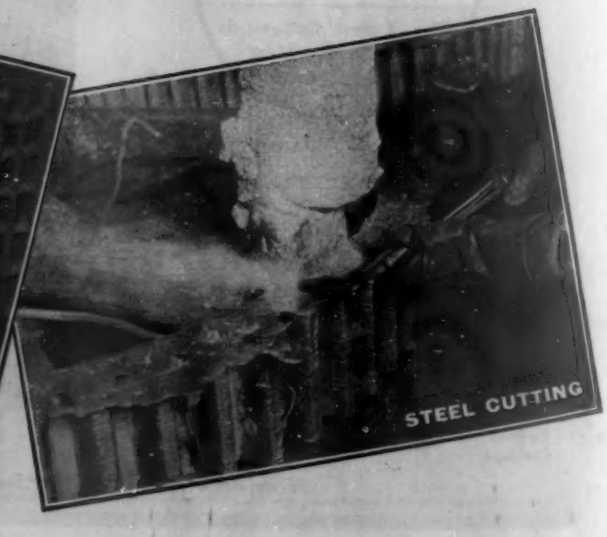
General Offices: Carbide and Carbon Building
30 East 42d St., New York
31 Plants—101 Warehouses

Prest-O-Lite



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Honest Advertising

A RECENT book by two serious minded students of American merchandising methods has been interpreted by many readers as a reflection on the value of advertising to the public. This, however, is because those readers are ignorant of the tireless activity of publishers and advertising men in keeping their profession on a high plane of worthy service. The mistakes, the evils and the unfair practices which the volume exposes are things which advertising men have worked hard to eliminate. Through associations, through their own periodicals and through co-operative work with publishers, the leading manufacturers have done more in this direction than the writing of a single book will ever do. The subject of truth in advertising is of great interest in a country where advertising has reached such heights as it has here, and there is food for thought for the readers of good business papers in the fact that this latest movement to get at the truth has not the merest whisper of criticism for technical and industrial advertising. The reason for it is that the better class of business papers have kept their houses clean, so that there is probably no other kind of advertising which is so worthy of the confidence of the reader as the advertising in his business paper.

Published on the 15th of Each Month by

THE WELDING ENGINEER PUBLISHING CO.,
608 S. Dearborn St., Chicago, Ill.
Telephone Wabash 7134

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M. J. Hungerford ..... Vice-President
H. S. Card ..... Secretary

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Last Advertising forms close at 8:00 a. m. on the 12th. To show proof for correction copy must be received at an earlier date and allowances should be made for delay to mails. All copy should be in by the 12th of the month at the latest.

The Welding Engineer does not publish in its news or advertising columns any matter that deals with or refers to either personal or legal controversies.

Authorized Representatives

CLEVELAND—R. K. Randall, 2094 E. 19th St.
DENVER—A. G. Odell, Public Opportunity School.
GREAT BRITAIN—Capt. D. Richardson, 30 Red Lion Square, Holborn London, W. C. I.
AUSTRALIA AND NEW ZEALAND—R. Hill, Matlock House, Davenport, Auckland, New Zealand.
SOUTH AFRICA—J. W. Arnison, 35a Victoria Ave., Benoni, Transvaal, South Africa.

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Air Reduction Sales Co.
Commercial Acetylene Supply Co.
International Oxygen Co.
Prest-O-Lite Co.

ACETYLENE CYLINDERS
Keith Dunham Company
Pressed Steel Tank Co.

AIR LIQUEFACTION OXYGEN PRODUCING PLANTS
Keith Dunham Company
Heylandt Sales Co.

ALUMINO-THERMIC WELDING
Metal & Thermit Corporation

ALUMINUM SOLDER
Crown Aluminum Solder Co.
Weldene Corporation

ANNEALING FURNACES
General Electric Co.
Westinghouse Elec. & Mfg. Co

APRONS (Asbestos)
Ideal Face Shield Co.

ASBESTOS INSULATED WIRE AND CABLE
Central Steel & Wire Co.

BLOW PIPES
See "Torches."

BOOKS
The Welding Engineer Pub. Co.
Electric Arc Cutting & Welding Co

BRAZING OUTFITS
Air Reduction Sales Co
Craftsweld Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Alexander Milburn Co
Modern Engineering Co.
National Welding Equipment Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
U. S. Welding Co.
Williams & Co.

BRONZE FILLER RODS
American Brass Co.
Central Steel & Wire Co.
Krembs & Co.
Mueller Brass Co.
Steel Sales Corp.

BUFFERS
N. A. Strand & Co.

BUTT WELDERS
See "Electric Resistance Welders"

CABLE (Arc Welding)
Allan Mfg. & Welding Co.
Electric Arc Cutting & Welding Co
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Lincoln Electric Co.
Quasi-Arc Weldtrode Co.
Una Welding and Bonding Co.
U. S. L. Battery Corp.
Westinghouse Elec & Mfg. Co
Wilson Welder & Metals Co.

CARBIDE
Air Reduction Sales Co.
National Carbide Co.
Shawinigan Products Corp.
Union Carbide Sales Co.

CARBON (Blocks, Paste, Electrodes, etc.)
Air Reduction Sales Co.
Electric Arc Cutting & Welding Co
Harris Calorific Co.
National Carbon Co.
Oxweld Acetylene Co.

CARBON BURNING EQUIPMENT
Air Reduction Sales Co
Craftsweld Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander Co.
Modern Engineering Co.
National Welding Equipment Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.

CAST IRON SOLDER
Crown Aluminum Solder Co.
Weldene Corporation

CONSULTING ENGINEER
E. F. Hollinger
R. E. Kinkead
R. C. Pierce

CONTRACT WELDERS
S. O. S. Welding Corp.

CUTTING ELECTRODES (Electric Arc)
Allan Mfg. & Welding Co.
Electric Arc Cutting & Welding Co
General Electric Co.
Lincoln Electric Co.
National Carbon Co.
Una Welding and Bonding Co.
Westinghouse Elec. & Mfg. Co.
Wilson Welder & Metals Co.

CYLINDERS (Acetylene)
Keith Dunham Company
Pressed Steel Tank Co.

CYLINDERS (Oxygen, Hydrogen)
Wm. Wharton, Jr. Co.

DRILLS, PORTABLE ELECTRIC
Stoody Company
N. A. Strand & Co.

ELECTRIC ARC WELDING OUTFITS
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American Steel Engineering Co.
Burke Electric Co.
Chicago Steel & Wire Co.
Electric Arc Cutting & Welding Co
General Electric Co.
Goodman Electric Machinery Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Lincoln Electric Co.
E. A. Lundy Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Stoody Co.
Una Welding and Bonding Co.
U. S. L. Battery Corp.
Welding Service Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRIC RESISTANCE WELDERS
Federal Machine & Welder Co.
General Electric Co.
Gibb Welding Machines Co.
Goodman Electric Machinery Co.
R. D. Thomas Co.

ELECTRODES (Carbon Arc Welding)
See "Cutting Electrodes"

ELECTRODES (Metallic Arc Welding)
American Steel Engineering Co.
American Steel & Wire Co.
Atlas Foundry Co.
Central Steel & Wire Co.
Chicago Steel & Wire Co.
Electric Arc Cutting & Welding Co
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corporation
Koro Corporation
Lincoln Electric Co.
Page Steel & Wire Co.
Quasi-Arc Incorporated
Reid-Avery Co.
Roebling, John A., Sons Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Company
Una Welding and Bonding Co.
Welding Service Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE HOLDERS
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American Steel Engineering Co.
Burke Electric Co.
Chicago Steel & Wire Co.
Electric Welding Machine Co.
Fibre-Metal Products Co.
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Koro Corporation.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Una Welding and Bonding Co.
U. S. L. Battery Corp.
Welding Service Co.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.

ELECTRODE TIPS (Resistance Welding)
Elkon Works, Inc.

ELECTROLYTIC OXYGEN AND HYDROGEN GENERATING EQUIPMENT
International Oxygen Co.

FACE SHIELDS (Arc Welding)
Allan Mfg. Co. & Welding Co.
American Steel Engineering Co.
Burke Electric Co.
Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Stoody Company
Strauss & Buegeleisen
Una Welding and Bonding Co.
U. S. L. Battery Corp.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.
Wilson Goggles, Inc.

FILLER RODS
Air Reduction Sales Co.
American Brass Co
American Steel & Wire Co.
Atlas Foundry Co.
Central Steel & Wire Co
Craftsweld Equipment Co.
Oxweld Acetylene Co.
C. H. Hollup Corp.
Imperial Brass Mfg. Co.
Krembs & Co.
Mueller Brass Co.
National Welding Equipment Co.
Koro Corporation
Page Steel & Wire Co.
Reid-Avery Co.
Roebling, John A., Sons Co.
Standard Steel & Wire Co.
Steel Sales Corp.
Stoody Co.
Stulz-Sickles Co.
Torchweld Equipment Co.
Welding Service Co.
Weldit Acetylene Co.
Williams & Co.

FIREPROOF PLASTIC MATERIAL
Air Reduction Sales Co.
Joseph Dixon Crucible Co.
National Carbon Co.
U. S. Welding Co.

FLUE WELDERS (Electric)
General Electric Co.

FLUXES
Air Reduction Sales Co.
Anti-Borax Compound Co.
Metal & Thermit Corp.
Central Steel & Wire Co.
Krembs & Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
Weldene Corporation
Weldit Acetylene Co.

GAS SAVING DEVICES
Harris-Calorific Co.
U. S. Welding Co.
Weldit Acetylene Co.

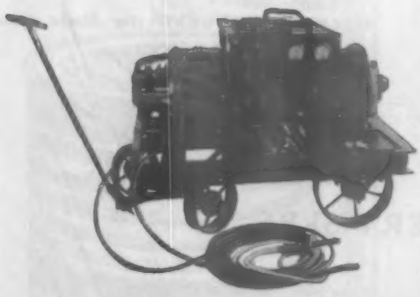
Part of the 40 tons of Wilson Welding Wire awaiting shipment to Manchuria, China, for the Baldwin Locomotive Works.

"Color-tipt"

Trade Mark Reg.
U. S. Pat. Off.

Insisted Upon *for* Repairs *in* Far-Away China

A large trans-continental railway in Northern Manchuria was recently faced with a series of vital repair jobs—so far away that the welding wire selected had to be absolutely dependable. They knew from long experience that they could trust Wilson "Color-tipt" Welding Wire anywhere, and forty tons were sent in one shipment to Manchuria.



The above is a Wilson Type S Single-Operator Motor-Driven Electric Welding Machine—designed for both production and repair work, and adapted for use wherever power is available. Its capacity is 25 to 300 amperes. Other Type S Machines include both single and two-operator units—gasoline-engine-driven, belt-driven and motor-driven—portable and stationary. Capacities: 25-250, 25-300, 25-600 amperes.

In every part of the world—in practically every industry—you will find Wilson Wire used where enduring strength in a weld is essential. Yet the superiority and economy of Wilson Wire are not confined to welds of paramount importance. After all, any welding worth doing is worth doing *right*. That requires perfect uniformity in the welding wire. And that is what Wilson Wire is noted for.

Every grade (analysis) of Wilson Wire runs uniform throughout—every rod is just like every other rod of the same grade. And there is a grade for each kind of metal—for the particular metal you are welding—for *your* particular industry. Each grade is designated by a color.

Write today for a sample of Wilson Wire—just indicate the kind of welding you wish to do. Also, ask for bulletins describing Wilson Welding Machines.

WILSON WELDER & METALS CO. INC., WILSON BUILDING, HOBOKEN, N. J.

WILSON

WELDING MACHINES AND WELDING WIRE

GLOVES (Asbestos)
Ideal Face Shield Co.

GAUGES
Moto Meter Co.
National Gauge & Equipment Co.

GENERATORS (Acetylene)
Air Reduction Sales Co.
Craftsweld Equipment Co.
M. Keith Dunham
Imperial Brass Mfg. Co.
Milburn, Alexander Co.
Modern Engineering Co.
Oxweld Acetylene Co.
U. S. Welding Co.

GOGGLES
Chicago Eye Shield Co.
Ideal Face Shield Co.
Strauss & Buegeleisen
Willson Goggles, Inc.

GRAPHITE (Rods, Blocks, Paste, Etc.)
Joseph Dixon Crucible Co.

GRINDERS (Portable Electric)
Stoody Company.
N. A. Strand & Co.

HELMETS (Arc Welding)
Allan Mfg. & Welding Co.
Burke Electric Co.
Chicago Eye Shield Co.
Electric Arc Cutting & Welding Co.
Fibre-Metal Products Co.
General Electric Co.
Gibb Welding Machines Co.
C. H. Hollup Corp.
Ideal Face Shield Co.
Lincoln Electric Co.
Northwestern Mfg. Co.
Owen Electric Mfg. Co.
Quasi-Arc Incorporated
Strauss & Buegeleisen
U. S. L. Battery Corp.
Waters Arc Welding Corp.
Westinghouse Elec. & Mfg. Co.
Williams & Co.
Wilson Welder & Metals Co.
Willson Goggles, Inc.

HOSE COUPLINGS
Carl A. Norgren Co.
See also under "Needle Valves"

HYDROGEN
Gas Products Association
International Oxygen Co.

HYDROGEN GENERATING PLANTS
International Oxygen Co.

LEAD WELDING UNITS
Air Reduction Sales Co.
Craftsweld Equipment Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Modern Engineering Co.
Milburn, Alexander Co.
National Welding Equipment Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
U. S. Welding Co.
Weldit Acetylene Co.

LIGHTERS (For Gas Torches)
Air Reduction Sales Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Stevenson Distributing Corp.
Torchweld Equipment Co.
U. S. Welding Co.

MANIFOLDS
Air Reduction Sales Co
Craftsweld Equipment Co.
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Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
U. S. Welding Co.

MECHANICALLY OPERATED CUTTING AND WELDING TORCHES
Air Reduction Sales Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.

MOLDING MATERIAL
See "Fire Proof Plastic Material"

MONEL METAL RODS AND ELECTRODE
Central Steel & Wire Co.
Wilson Welder & Metals Co.

NEEDLE VALVES
Air Reduction Sales Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
U. S. Welding Co.

NITROGEN
Air Reduction Sales Co.
Gas Products Association
Linde Air Products Co.
International Oxygen Co.

OXYGEN
Air Reduction Sales Co.
Gas Products Association
International Oxygen Co.
Linde Air Products Co.

OXYGEN PRODUCTION PLANTS
Keith Dunham Company
Heylandt Sales Co.

PREHEATING DEVICES AND OVENS
Imperial Brass Mfg. Co.
Metal & Thermit Corp.

RAIL BONDS
Una Welding and Bonding Co.

RAIL JOINT WELDERS
Una Welding and Bonding Co.

REAMERS (Portable Electric)
N. A. Strand & Co.
Wodack Electric Tool Corp.

REGULATORS
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International Oxygen Co.
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Milburn, Alexander, Co.
Modern Engineering Co.
National Welding Equipment Co.
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Stoody Company
Torchweld Equipment Co.
U. S. Welding Co.
Welding Service Co.
Weldit Acetylene Co.
Williams & Co.

SEAM WELDERS
See "Electric Resistance Welders"

SPOT WELDERS
See "Electric Resistance Welders"

TANK CONNECTIONS
Air Reduction Sales Co.
Harris Calorific Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Oxweld Acetylene Co.
Torchweld Equipment Co.
U. S. Welding Co.

THERMIT WELDING
Metal & Thermit Corp.

TORCHES (Welding and Cutting)
Air Reduction Sales Co.
Craftsweld Equipment Co.
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International Oxygen Co.
K-G Welding & Cutting Co.
Milburn, Alexander, Co.
Modern Engineering Co.
National Welding Equipment Co.
Oxweld Acetylene Co.
Stoody Company
Torchweld Equipment Co.
U. S. Welding Co.
Welding Service Co.
Weldit Acetylene Co.
Williams & Co.

TRUCKS (Cylinder)
Air Reduction Sales Co.
Imperial Brass Mfg. Co.
International Oxygen Co.
Torchweld Equipment Co.

VALVES
Air Reduction Sales Co.
International Oxygen Co.
Kerotest Mfg. Co.

WELDING COMPOUND (for Shape Welding)
Air Reduction Sales Co.
Harris Calorific Co.
Joseph Dixon Crucible Co.
Modern Engineering Co.
National Carbon Co.

WELDING ROD HOLDERS
C. Sorensen

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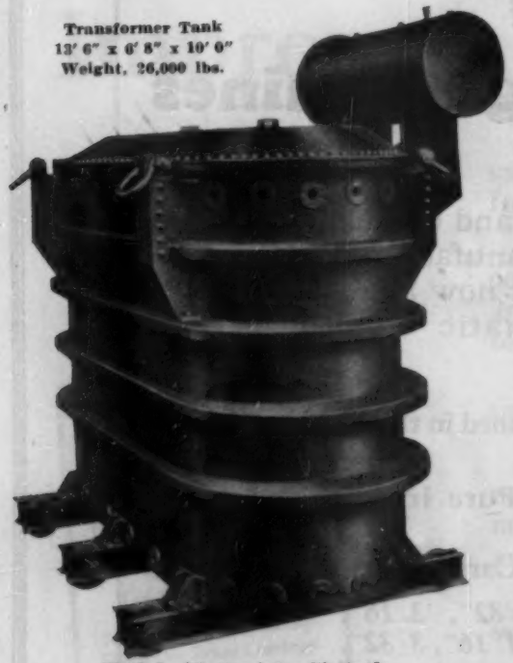

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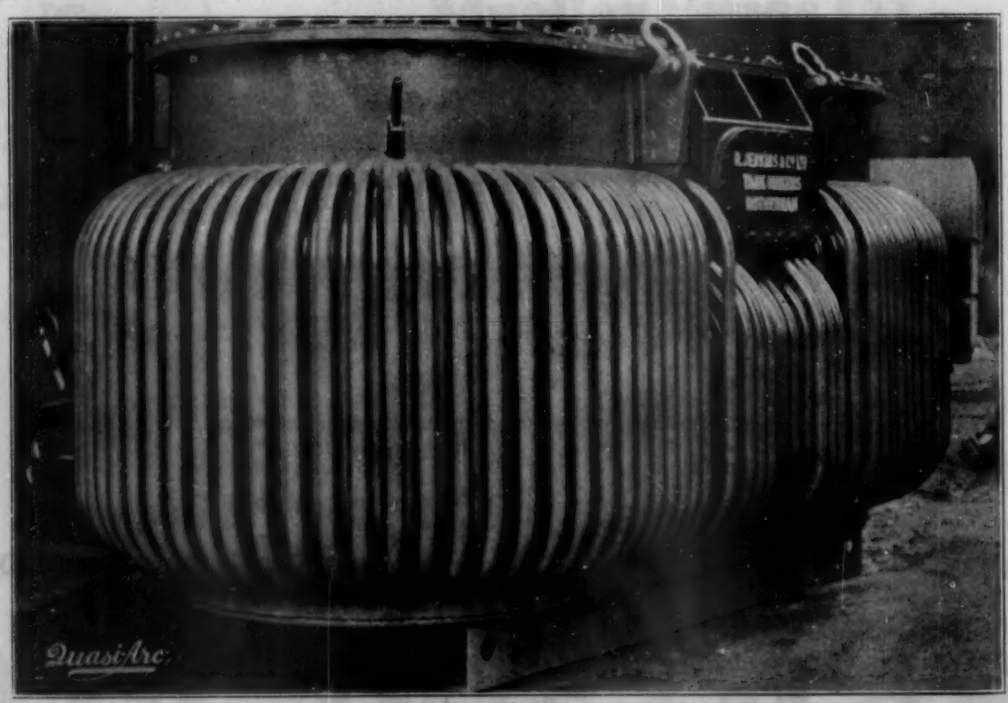

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EDITORIAL

Engineers with the Right Idea

ENGINEERING departments of many universities and a number of technical schools have recently shown a keen interest in the study of fusion welding processes and their applications. Here and there graduate students are found to be making special investigations in their work toward advanced degrees, and members of the faculty doing special research work. The most immediately useful work is undoubtedly the two or three-day welding conferences. These give some new and useful knowledge to men whose everyday work involves welding of some sort, bring practical men and scholars into intimate contact, so that each can learn how human is the other, and give the coming generation of engineers a knowledge of welding which will be a real necessity to them a few years hence. The student of engineering who makes welding the subject of his thesis is particularly deserving of encouragement and guidance because his contribution to the art is so badly needed, and also because this industry needs engineers who know welding. Some of the biggest welding projects of the past year have been studied from this angle, and it appears that practically all of them were engineered by men who did not become familiar with the process until long after they had become well established in engineering work. In fact, a few of the most highly respected advocates of welding were frankly opposed to it a couple of years ago. Years which they might have given to perfecting designs and procedure have had to be devoted to winning their support. Young fellows who start at the beginning with the idea of helping to put welding on a sound basis are real assets to the industry.

The Unwritten Ingredient

ONE evening the thrifty citizen read that fifteen cents' worth of raw materials purchased at the corner drug store would make a tooth powder equal to any of the high priced preparations for which he was paying supposedly exorbitant prices. He gleefully copied the formula and recited it to the druggist the following day. To his surprise, the bill was sixty-five cents, and to his further discomfiture the mixture turned out to be a chalky unpalatable fizzle, for which he was glad to substitute a real good tooth paste at once. Perhaps the man who wrote the book knew how to make tooth powder. Certainly the thrifty citizen did not. Skilful selection of raw materials and skill in handling them are things which have to be paid for when quality is wanted in the finished goods. The blessing of the trade mark is that it identifies these ingredients which do not appear in the formula. "I could make this material," said the welding superintendent of a prominent manufacturing plant to a salesman, "but that is your business. As long as the quality is right, I am only interested in using it right." He is wise enough to stick to his line, not begrudging the makers of welding rods, fluxes, etc., the profits they honestly earn by knowing how to turn out quality products.

A New Profession

WITHIN a period of just a few weeks announcements have been received from three consulting engineers in as many different cities, all of them specializing in the application of welding in construction or production work. These announcements come at a time when independent and unbiased engineering service is needed by many industrial plants, though there are a few who have put engineers of their own at work on welding problems. Hundreds of cases exist where the services of a good engineer who is thoroughly familiar with all phases of welding can put welding processes to work on an efficient basis in a comparatively short time and organize a department so that it can almost run itself. If welding is to be seriously considered as an important department there is everything to be said in favor of putting all its operations on a sound engineering basis. A consulting engineer who can make welding fundamentally right in any plant will more than pay his way.

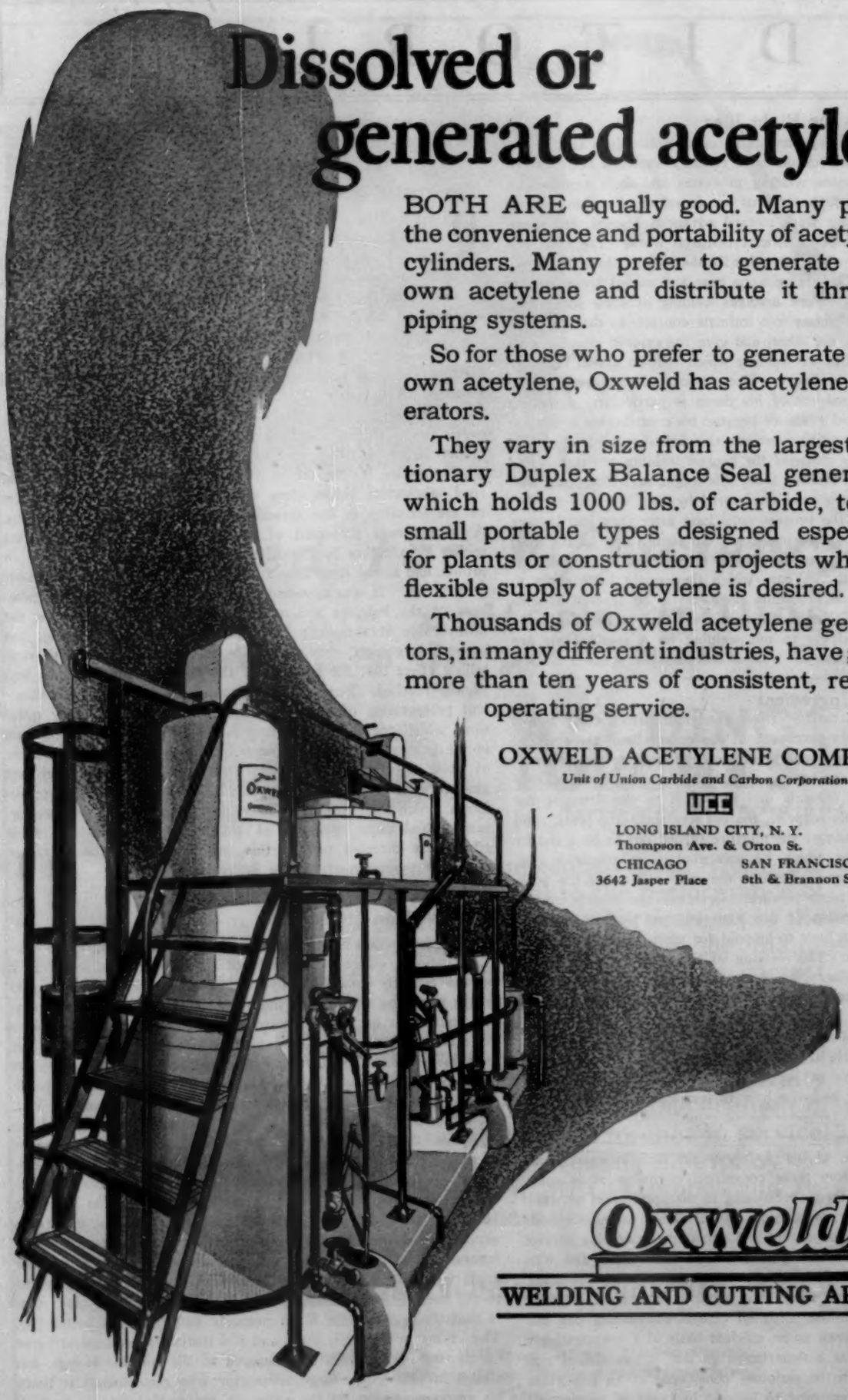
The Publisher's Responsibility

DURING the recent convention of the Associated Business Papers, Incorporated, the publisher members of this group, which includes practically all of the leading trade and industrial journals in the country, were privileged to listen to an address by Mr. Charles Abbott, the executive director of the American Institute of Steel Construction, in which the speaker presented to the publishers their opportunities for future service in terms of responsibility. In recommending executive and editorial policies for these publications, he came close to paraphrasing several portions of the Code of Ethics, upon which the A.B.P. organization is based. But while he seemed to talk in general terms, every reader of his excellent talk will have a feeling that Mr. Abbott had a particular industry in mind. This illusion is somewhat dispelled by the recital of the experience of the structural steel fabricators before steps were taken to organize the efforts of the industry in the direction of more profitable operations. A picture was presented of an industry which was suffering within by a rather haphazard scramble for orders, regardless of profits, and at the same time suffering from the inroads of outside competition. It was apparent that individually the leading members of the industry did not seem to be able to overcome the unfavorable conditions under which they were operating, but properly organized they were able to act collectively with such telling effect that the solution of the most serious problems was rapidly reached. Business paper publishers can see in the excellent presentation of that experience the answers to many questions which are constantly being asked of them by thinking men in the industries which they serve. They welcome a new outline of their own responsibility to American industries; they are glad to extend the greatest possible co-operation in all movements which tend to correct undesirable conditions. They recognize the absolute necessity of profitable operations and their efforts are directed toward this end on a broad basis, rather than to the service of narrow interests.

Approved on Its Merits

ONE important bit of evidence of the need for continued educational effort in the field of pipe welding is found in a survey recently conducted by one of the leading trade papers in the plumbing and heating industry. This publication has found its readers to be keenly interested in its published discussions of pipe welding methods and pipe welding economies, and their own investigations of these subjects so impressed them with the value of welding that they set about to find out as near as possible to what extent the process was used by their readers. It is well-known by those whose business consists of selling welding equipment and supplies that the percentage of firms engaged in pipe work who use welding to any appreciable extent is comparatively small. It does develop, however, that this minority consists largely of the leading firms in the country in that line, many of them nationally known. In other words, the process is generally regarded by the most prominent and successful piping contractors as a useful and economical tool. There is another angle which should not be overlooked when presenting arguments to the heating and ventilating field in favor of welded pipe; that is that the welded line when properly made gives a better job. The saving in money is there and is a distinct advantage in favor of the welding process as compared to the use of fittings, but almost invariably the large contractor who recommends it bases his recommendation on the value of the welded line instead of on its cost.

Dissolved or generated acetylene?



BOTH ARE equally good. Many prefer the convenience and portability of acetylene cylinders. Many prefer to generate their own acetylene and distribute it through piping systems.

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WELDING AND CUTTING APPARATUS

Welded Pipe Becoming Standard*

Leak-pooof Construction Is Most Important—Welded Lines Are Better Adapted to Varied Conditions—More Resistance to Stresses and Corrosion

By Louis Stein†

A DISCUSSION of this character might be made to cover a good many pages of printed matter but a good deal of general interest might be abridged to a size proportionate to the time allotted for its presentation. It appears to the writer that if there are set up a few of the outstanding points of interest which a conference of this kind might reasonably inquire into, the subject may be treated briefly and at the same time provide enough information to disclose why and how many gas utilities choose to install steel transmission and distribution mains with welded joints.

The practice of making oxy-acetylene welded joints in gas mains while not new has been found to be of greater interest to the gas engineer during the past six or eight years than ever before. Likewise, it is rapidly becoming standard in the matter of the transmission of oil through steel pipe lines in preference to other types of jointing. In view of the results which have been attendant both economically and otherwise, it is rather difficult to account for the lethargic indifference of many gas utilities to the many advantages of welded steel construction. Fortunately, the younger engineers, unfettered by tradition and century old practices, are making their ideas sufficiently emphatic in the gas industry as to bring about a departure from what has been considered conservatively safe and sound engineering.

If it were possible to accurately describe an ideal gas distribution system from the viewpoint of the most alert of the gas engineering profession, it is believed that such a description would include, first of all, leak-proof construction; second, adaptability to all sorts of working conditions, particularly in the matter of pressures; third, the ability to withstand various types of stresses; and fourth, resistance to external and internal corrosion. It might be empirically stated, without fear of successful contradiction, that welded steel pipe construction embodies most of the conditions named. As a matter of fact, in non-corrosive soils it would appear that this type of construction is substantially ideal. There are quite a few evidences of steel construction pointing to a life of two generations or more where soil conditions have contributed very negligibly to corrosion. In view of the fact that many communities offer soil conditions which are practically ideal from the corrosion standpoint, it becomes incomprehensible to the average engineering intelligence why so many, charged with the responsibity of the best type of construction, continue to engage in practices which are not in consonance with the present day viewpoint. The foregoing idea probably should be amplified by the brief explanation that it is becoming considered to be more and more sound practice to increase the load factor on existing and new distribution system installations. Such increase in load factor makes it more desirable and economical to approach higher pressures in many situations. Higher transmission pressures naturally require installations which do not leak, in fact, installations which if properly made will never leak.

1. Welded Line Capped for Testing. 2. Ice Saw Making Way for Welded Line Across Lake. 3. Shelter for Mid-Winter Welding. 4. Laying Line in Three Inches of Water. 5. Pipe Ready for Welding Alongside Ditch. 6. A Pipe Welder's Camp.

It therefore is a point of interest to note that there is a very radical departure from the installation of threaded and coupled steel pipe in those situations where steel is indicated as being economically sound. That departure consists of a discontinuance of the old practice of installing threaded and coupled joints and in its place the substitution of welded construction. It is not too much to add that such construction is now taking place on hundreds of miles of natural gas and oil lines, even where such lines are installed in comparatively bad soils. This has been brought about thru the availability of several types of protective coatings for steeel pipe which successfully resist the attacks of soil corrosion. Then too, there is a second reason for welded construction in this particular field, namely, the facility of reconditioning such pipe lines.

From the foregoing it will not be difficult to understand why the Operating Company with which the writer is affiliated, gives preference in every way possible to steel gas main construction with oxy-acetylene welded steel joints. Actually in all but one or two properties, everything from two inches in diameter up is of this type of construction.

---

*Paper read before the Welding Conference at University of Minnesota, Minneapolis, Oct. 22, 1927.

†Gas Engineer, Northern States Power Co., Minneapolis, Minn.

(Note: Acknowledgment is made to the SanDiego Consolidated Gas and Electric Co., San Diego, California, and the Northern States Power Co., Stillwater, Minn., Division, for their courtesy in furnishing photographs used to illustrate this paper.—Editor.)

The exceptions alluded to are in situations where there is still some doubt as to the ability of protective coatings to protect steel construction against soil corrosion. Even in those properties, however, experiments have been going forward for several years and are now under way to determine the possibility of economically substituting steel construction for cast iron, and this in spite of the fact that in the smaller sizes of pipe the costs are approximately the same for cast iron as for steel. The practice of installing steel welded mains has been standardized since 1924 and to date there appears to be many reasons why it should not be discontinued. There have been no breaks, and so far as can be discovered, no leaks either in the mains carrying low pressure gas or in those transmitting gas at pressures approaching 65 pounds per square inch. When the subject was first considered, the personnel of the engineering staff knew practically nothing of what such a change would involve, either in economics or

A Very Simple and Efficient Clamp for Securing Good Alignment.

in the ability to successfully make the installations. It was therefore with some trepidation and with a full confession of ignorance that the venture was embarked upon. Fortunately, a sister utility on the Pacific Coast had been engaged in this practice for eight or ten years, and it was not a difficult matter to arrange for a prolonged visit to this property for the purpose of learning first hand, the problems that would be met with in the matter of making the transition. One of the earliest benefits that was derived from this tuition was a saving of several thousand dollars in the construction of a high pressure transmission line which had been estimated on the basis of threaded and coupled steel. This is of more than usual interest when it is considered that the property in which the installation was made had had no previous experience whatsoever in fabrication of welded joints by the oxy-acetylene method. In general it was the viewpoint following the inspection and schooling on the Pacific Coast that any other type of steel construction except the welded type was passe.

One matter of outstanding importance was that of obtaining skilled welders, and not a great deal of time was wasted in arriving at the conclusion that the best way to obtain such skill was to train it in welding schools, the activity in which would be devoted exclusively to pipe welding. The most eligible men were chosen from the various gas properties, most of whom barely knew whether a welding torch burned acetylene or kerosene. The first such school was organized in the winter of 1924 with the assistance of the Air Reduction Sales Company of Minneapolis, which Company provided competent instructors. The school lasted les than a month and resulted in the making of comparatively skilled pipe welders from the men who were sent as students. The type of work which these men performed in the field the following spring was of such character as to lend encouragement to the schooling idea. It is not intended to convey the impression by any means that the welding school was able to turn out finished welders, although it is a fact that the work which they performed was of considerably higher grade than that turned out by many so-called welding shops. Added to the schooling, the one season of gas main construction the results might be said to approach that of highly skilled men.

Since that time, and at the close of the winter each calendar year, schooling has been repeated up to and including March, 1927. It is felt at this time that posibly it will be entirely satisfactory to send fewer men each year, or to hold the school every other year. The men have become sufficiently skilled to successfully perform on mains regardless of whether such lines are alive with gas or not. On all new work the house services are welded to the mains instead of being threaded into them as in the past, and the construction by test is actually considerably stronger than the former type, and of course does not leak. Furthermore, it is both possible and feasible to weld such services to mains whether such mains contain gas or not. In the case of "live" mains, short nipples are first welded to the pipe and the opening later drilled through by means of proper equipment. In the case of new work, where no gas is present, it is possible to use a cutting torch for making the opening and welding the short nipple to the main afterward.

The ordinary procedure when installing new mains, particularly in territory that is not congested with traffic and where several hundred or several thousand feet of ditch may be opened at one time, is to weld everything on top of the ditch, the pipe being supported on rollers so that the welders' helpers may rotate it at a speed to suit the convenience and skill of the welders. As much as several city blocks at a time may thus be welded before placing in the ditch and before connecting to an existing pipe line. Actually, every piece of construction met with offers a problem of handling which is different from any other experience, and a good deal of common sense must be applied to successfully meet each situation as it arises.

There are many places where nearly 100% of the welding must be performed in the ditch itself, which, of course, requires that nearly every joint has some over head welding applied to it. The time allotted to this discourse is not sufficient to offer very much detail concerning the various types of problems to be solved in the field but it is interesting to note in passing that the welding of high presure mains containing gas is not the hazardous undertaking that it would seem. To illustrate, assume that a gas main of some normal size, say four or six inches in diameter, is being extended into new territory, a sub-division for instance, and there must be no interruptions of service on the existing main which for convenience may be carrying pressures of from 40 to 70 pounds per square inch. Usually such mains have valves at certain intervals, such as each quarter mile or each half mile, and the last valve in the line is therefore closed before the new line is welded to the old. Possibly there have been sufficient number of men on the job to have welded a mile of the new line, and this may now be ready to place in the ditch and connect to the live main. The welder charged with that specific work welds the new line to the old on the far side of the valve and all but several hundred feet of the new is "snaked" into the ditch. It now becomes necessary to determine what leaks exist, if any, in the new work. The end of the new line is therefore closed with an expansion stopper which is also clamped to the pipe to prevent its

accidental blowing out under pressure, and the high pressure valve referred to in the foregoing is opened, permitting the high pressure gas to fill the new piece of construction. Each joint is subsequently tested with soap suds and if any are found to be leaking they are either peaned or made over. Following successful examination of the one mile construction, the valve is then closed, the clamps are removed from the expansion stopper in such manner as to permit it to be blown from the line quite suddenly, in order to release any accumulation of scale and dirt which may be in the line. An interesting point of construction has now been reached, assuming that the next weld for the next mile section is to be made at the end of the piece which has just been tested and purged with gas. Bearing in mind the fact that the valve spoken of earlier is now in a closed position and the installed line filled with gas or a mixture of gas and air which may be explosive, it is proper to state that such inflammable or explosive mixture must be removed before welding can commense again. This is accomplished by the simple expedient of having the welder light his torch, acetylene only being burned, and causing this flame to come near the open aperture of the pipe. This he does by lowering the light torch into the ditch from above. If the mixture is merely an inflammable one in the pipe, it is ignited and burns for a few minutes until there is no longer any combustible gas let. On the other hand, if the mixture is an explosive one, the ignition occurs with a more or less loud detonation, but without causing any damage whatsoever. From this point the construction is merely a repetition of what has gone before. It is also possible to test new lines with air under pressure, supplied from either portable or stationary air compressors, depending upon the situation, particularly where it is not necessary to immediately tie new work into existing mains. Low pressure construction is ordinarily tested with portable compressors at a pressure of 10 lbs. per square inch, and defects, if any, are noted and repaired. In the case of doing work on live mains, gas is excluded from the new work by means of bags or a combination of bags and stoppers.

A discussion of this kind would not be complete without the statement that on all steel gas main construction it is absolutely unnecessary to purchase any fittings, since it is standard practice to make them in the field as required. This involves a saving in time and material. This applies not only to the various types of standard fittings, such as elbows, tees, Ys, etc., but to reducing or expanding fittings likewise, which are used when changing from one size of pipe to another, although it has been found convenient to purchase and have on hand, swedge nipples of various dimension combinations.

In conclusion, the installation of welded steel pipe construction has been found to be eminently successful. There is involved in it the economies of speed, strength, flexibility and the ease with which 100% good workmanship may be obtained. Above all, the matter of physical leakage, the "agent provocateur" of the gas engineer with respect to the transmission and distribution of gas, is substantially eliminated.

MARITIME COMPENSATION FOR LAND WORKERS

Tradesmen who occasionally work aboard vessels were provided with compensation right in the "Longshoremen's and Harbor Workers' Compensation Act," effective July 1st of this year. Employees who are sent on board for any purpose connected with ship's business are included. Among these are ship chandlers, supply men, such as grocers, butchers, dairy men and bakers, repair men of all sorts, and installers of special equipment, such as lighting, heating, ventilating, refrigerating, and radio appliances. Cargo handlers, other than members of the crew are also beneficiaries.

Compensation ranges from $8.00 to $25,00 per week in addition to medical expense. Provision is also made for dependents in case of death from injury.

Employers, subject to the law, no matter how infrequently, are required to carry insurance protection either with an authorized carrier, or by obtaining from the Commission a permit to self-insure. A fine of $1,000 and imprisonment are provided for failure to comply with these provisions.

The administration of this Act is entrusted to the U. S. Employees' Compensation Commission, Washington, D. C. The country has been divided into fourteen districts with offices in the following cities: Boston, New York, Philadelphia, Baltimore, Norfolk, Savannah, New Orleans, St. Louis, Chicago, Cleveland, Louisville, Galveston, San Francisco and Seattle.

IS PENETRATION ALWAYS DESIRABLE IN ELECTRIC ARC WELDING

By C. J. HOLSLAG*

The question of long arc in welding is pretty well decided in favor of the short arc with reasonable facilities for obtaining a long arc temporarily where desirably necessary, such as corners, angles, gaps, etc.

After thinking over the question of penetration for years, it suddenly came to me that penetration is not always desirable. For instance, suppose you were padding a forged piece that had been worn on one side or on either of the edges. Supposing the piece was 1 inch thick and 1/8 of an inch had been worn away and you desired to replace it by arc welding. If you had a penetration of 1/8 of an inch, the original forged piece would then be 3/4 of an inch and the weld 1/4 inch. If you had a penetration of 3/8 of an inch, the original piece would be 1/2 inch thick and the weld would be 1/2 inch. This would mean that your original forged piece had been replaced by a casting with one-half of its thickness and certainly no one could claim that a casting, even one made by the electric arc, is as good as a forged piece.

Electric arc welding is pretty good, but you must always keep in mind that it is a casting and that rolled or forged pieces were castings eight or ten rollings or forgings ago. On mild steel the replacing of rolled or forged pieces with castings is not so disadvantageous, but above .25 carbon it becomes very necessary to take cognizance of this fact.

For instance, during the war, it was quite popular to nick shell stock with the electric arc and break it like so much cord wood. The general rule to follow, especially on live loads, is that all welds in steel above .20 carbon should be carefully annealed.

Another thing to be considered is a work piece subject to detail fractures or progressive fractures. A forged or rolled piece should probably not be replaced by welding, especially without annealing, where a crack or defect can start in the weld due to its being a casting, because such a progressive fracture may extend from the weld into the forged or rolled plate due to the perfect bond of the welding, even though annealing has taken out the marked difference in grain structure between the welded steel and the original metal.

There is one very desirable use for penetration, however, and this is in breaking down the edges in joining plates, sheets and structural shapes to make a weld clear through or as deep as possible in order to save the expense of chamfering or veeing out. With very heavy current values a weld casting can be made by breaking down the edges, generally a bit separated to facilitate the downward flow.

*Electric Arc Cutting & Welding Co., Newark, N. J.

Uniform Bends for Welded Lines

New Pipe Bending Process Produces Bends Which Can Be Welded to Straight Lengths in Combinations to Secure All Possible Types of Pipe Assemblies

IN a previously published article in the Welding Engineer announcement was made of the purchase by M. Keith Dunham of American rights on patents orginating in Germany and covering a new method of making circular pipe bends from straight lengths of pipe. A more recent announcement of the formation of the Pipe Bending Process Company at Louisville, Ky., marks also the first actual production of bends in America by this new process. It is a development in industrial piping in this country which holds forth many interesting possibilities to the welding industry. This is particularly true because the pipe bends so produced are ideally adapted to the welded type of installation.

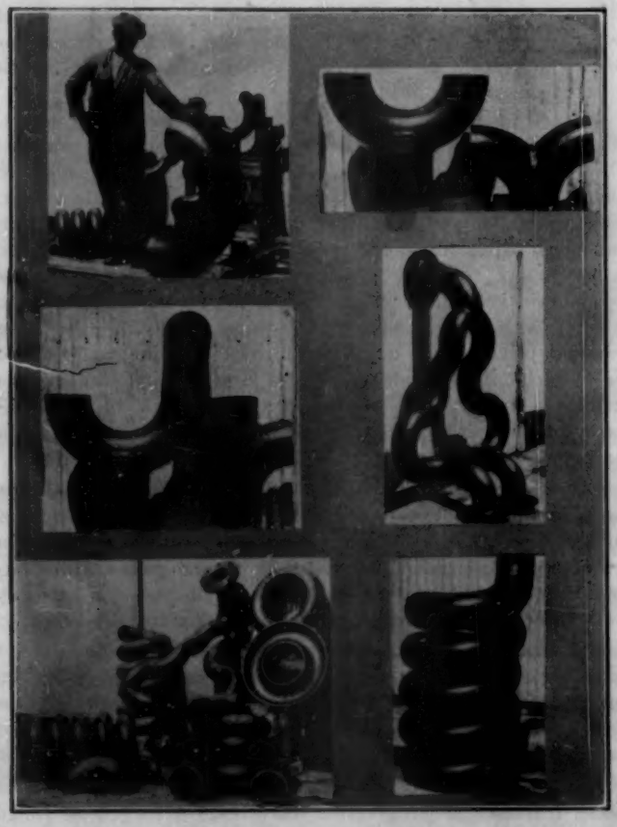

Fig. 1. Showing Assemblies Which Can Be Made With Welded Bends.

Reviewing briefly the comments made on the process in a previous issue, the idea of pipe bending is not new, several different methods being commonly used. The process to be described, is unique in providing in combination all the following favorable features:

1. Uniform thickness of wall.
2. Perfect smoothness of surface.
3. Smallest possible bending radius.
4. Minimum weight.
5. Simplicity of assembling.
6. Absolutely circular cross section.
7. Production of bends to allow change in direction of pipe at any desired angle.
8. Production of pipe coils of minimum radius.

The nature of the pipe bends produced by the new process, and their flexibility of application, can be readily understood by reference to the photographs reproduced in Figure 1. The photographs show not only the product itself but also specimen assemblies welded together in various shapes. It is readily observed that such bends can be made up into every conceivable combination or shape.

Figure 2 and Figure 3 are views of the pipe bending plant now in operation in this country. The essential parts of the

Fig. 2. One Bend Nearly Finished.

equipment are a gas furnace and an hydraulic press. At the business end of the press is a long steel shaft, over which a straight length of pipe is pushed, bearing on a flat ring which is to be pushed ahead by a steel sleeve. After the straight

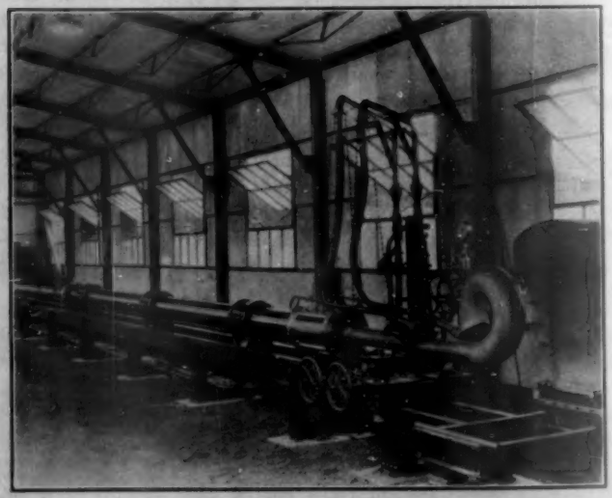

Fig. 3. Bend is Finished and Oven Run Back So Bend Can Be Cut Off.

pipe is set on the shaft, a horn shaped mandrel is attached to the forward end of the shaft by a double threaded turnbuckle coupling. Hydraulic pressure forces the pipe forward to a tight fit on the mandrel. Then three gas blow torches are turned on the end of the pipe until it is nearly plastic. More

presure is applied, so that the pipe is pushed over the mandrel as fast as it is heated enough to work. The design of the mandrel determines the curvature and the wall thickness, and variations from a straight bend to a wide coil are obtained by the location of the heat during the operation. The machine is shown making a 180-degree bend. The pipe has been previously cut halfway through with a hacksaw. When the end of the bend reaches the main part of the pipe, the furnace is withdrawn and a cutting torch is used to complete the cut.

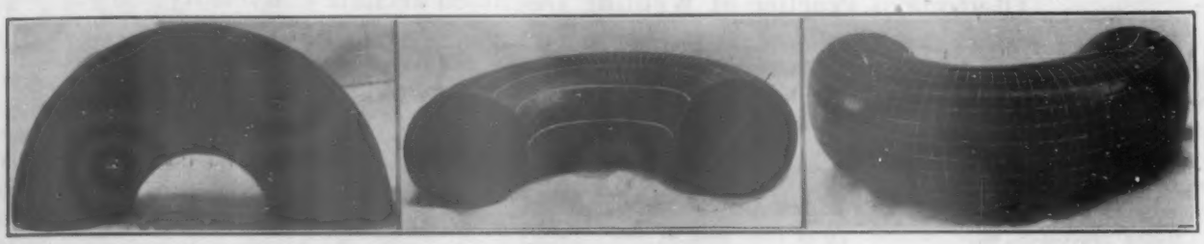

Fig. 4. Showing How Metal Is Distributed in Bending.

As the illustrations indicate, the bends are of larger diameter than the original pipe. Reference to figure 4 will show just what happens to the metal in the pipe. A straight length of 3-inch pipe was scribed with half inch squares and then run through the machine. Top, side, and bottom views show in what areas the metal is unaffected, where it is stretched, and where it is compressed. By proper design of the mandrel and operation of the apparatus during the process, this distribution of the metal is controlled so as to produce bends without variations in wall thickness, with perfect smoothness in contour both inside and outside.

Fig. 5. Note Uniformity of All Dimensions.

These bends lend themselves particularly to welded jointing. Unless put through an additional operation for end straightening purposes, they cannot be threaded. In most pipe work this is a distinct advantage because welded pipe joints require less detail work, are more economical to make than fitted joints, and permit the use of standard pipe in installations where fittings would require the use of extra heavy piping.

Elbows and return bends have often been made by fabricating and welding together several sections cut from straight pipe. This involves the use of a number of welds which would be eliminated by smooth circular bends. Pipe welders will appreciate the convenience and economy of a bend which requires only two welds and can be as uniformly dimensioned as a cast fitting.

Fig. 7. Simplicity of Welded Bend Compared to Cast Fitting.

A survey of the potential market is in progress to determine the method of putting these bends at the disposal of pipe fabricators.

A. I. S. C. FIREPROOFING SPECIFICATIONS

To the end that the fireproofing of the steel frames of buildings may be placed upon a more rational basis, and may be brought into conformity with the latest developments of scientific research, a committee of engineers, working under the auspices of the American Institute of Steel Construction, has recently completed a standard specification for the fireproofing of structural steel.

Up to the present time, fireproofing specifications and codes have included requirements which applied to all types of steel-frame buildings, regardless of the purposes for which the structure was used. It is stated by officials of the Institute that such inflexible requirements are unjustifiable, since the fire hazard is not the same in a department store and an office building, or in a factory turning out cast iron stoves and one manufacturing wooden furniture.

In the new specification, the fire hazards are based upon the weight of combusible material per square foot of floor area. It is stipulated that the fire-resistive covering of the steel must be sufficient to maintain a stated minimum temperature in the steel under fire conditions. The test procedure conforms to that of the American Engineering Standards Committee for Fire Tests of Building Construction and Materials.

The specification is divided into seven sections. Section 1 defines the purpose and scope; Section 2, fires; Section 3 fire hazards; Section 4, steel; Section 5, fireproofing materials; Section 6, tests; and Section 7, safety factor. According to officials of the Institute, use of the specification will eliminate unnecessary costs now imposed upon the construction of steel-frame, fire-resistive buildings.

Minnesota Holds Welding Conference

Supervisors and Operators Come from All Directions to Hear Theory and Practice of Welding Discussed at State University

When it was first proposed that a welding conference be called at the College of Engineering of the University of Minnesota, doubt was expressed by some as to whether such a program would be productive of sufficient practical results to make it worth while. Those in charge, however, aware of the rapid progres being made in the technic and applications of all welding processes, were confident that that part of the welding industry represented in Minneapolis and St. Paul and nearby cities would appreciate such an opportunity for learning the latest developments in welding methods and equipment.

Those who attended the conference declared unanimously that it was a success, and some who came some distance were heard to remark that the trip was well worth while and that they hoped similar conferences would be arranged in coming years. More than 300 operators, foremen, superintendents and engineers registered for the regular sessions, and great interest was evidenced in the papers and the discussions which followed, and in the exhibits of the manufacturers.

The meetings were also attended by a number of the engineering students of the University. In some cases lecture classes were dismissed so that the students might attend the sessions of the conference. When it is considered that many of these students will some day become plant superintendents, designing engineers, or in other capacities will decide questions of design or of production methods, it is evident that the results of these welding conferences can be far-reaching. All who heard the reading of the papers must have gone away with a new vision of the possibilities contained in the welding processes and the future of the welding industry.

The curriculum in Mechanical Engineering includes instruction in the fundamentals of oxy-acetylene, electric arc and resistance, and thermit welding, as well as actual manual practice in a completely equipped welding laboratory. The instructor in this course, Mr. Thos. P. Hughes, with Professor S. C. Shipley, acting head of the Mechanical Engineering Department, was largely responsible for the idea of this conference and for the working out of the details of the program.

The exhibits of the manufacturers of welding equipment and materials were conducted more with a view to instructing in the uses of the products rather than to an effort toward sales. From early morning till late in the evening the hall housing the exhibits was filled nearly to capacity.

The following manufacturers demonstrated their products:
Metal and Thermit Corporation,
Linde Air Products Co.,
General Electric Co.,
Westinghouse Electric & Mfg. Co.,
Smith Welding Equipment, Corp.,
Air Reduction Sales Co.,
Imperial Brass Mfg. Co.,
Carbic Mfg Co.,
Lincoln Electric Co.

The program of the papers and addresses, many of which were illustrated with stereopticon or moving pictures, was as follows:

PROGRAM

Thursday, October 20
Afternoon

Professor S. C. Shipley, Acting Head, Mechanical Engineering Department, Presiding

Address of welcome by O. M. Leland, Dean of the College of Engineering and Architecture

This Picture Is Evidence of the Way Welding Operators, Supervisors, and Engineers Responded to the Invitation to a Conference on Wel... First Meeting of the Kind to Be Held in Minnesota. The Success of the conference ...

Paper: "General Aspects of Oxy-Acetylene Welding and Cutting"
R. W. Rogers, Oxweld Acetylene Co., New York
Paper: "Welding Rod Quality as a Factor in Welding"
J. J. Crowe, Research and Development Dept., Air Reduction Co., New York
Paper: "Some of the Most Recent Uses of Arc Welding in Industry"
Mr. A. G. Bissell, Welding Eng., Westinghouse Electric Co., Pittsburgh, Pa.
Discussion on Papers
Demonstrations

Evening

Informal dinner at Minnesota Men's Union
Toastmaster—Professor S. C. Shipley
Motion Picture: "Oxygen the Wonder Worker," with Liquid Air Demonstrations
Mr. G. E. Harcke, Airco D-B Welding Institute, New York
Address: "Stelliting Metal Parts"
Mr. E. F. Smith, Haynes Stellite Co., Chicago

Friday, October 21
Morning

Paper: "Factors Involved in Economical Gas Cutting"
Mr. J. L. Anderson, Research and Engineering Dept., Air Reduction Co., New York
Paper: "The Application of Gas Welding to Manufacture of Plumbing Fittings"
Mr. Smith, President, Welding Equipment Corp., Minneapolis
Paper: "Apparatus Manufactured by Arc Welding"
W. M. B. Brady, Welding Specialist, General Electric Co., Chicago
Discussion on papers
Demonstrations

Afternoon

Paper: "Fusion Welding with Application of Autogenous, Electric, and Thermit Welding to Railroad Equipment"
Mr. G. H. Gjersten, Master Welder, Northern Pacific Railroad St. Paul
Paper: "Bronze Welding"
Mr. R. C. Price, Smith Welding Equipment Corporation, Minneapolis
Paper: "Procedure Control in the Welding Industry"
Mr. J. W. Haygood, Linde Air Products Co., Chicago
Film: "The Magic Flame"
American Carbolite Sales Co.
Discussion on papers
Demonstrations

Evening

Paper: "The Use of Arc Welded Steel to Replace Castings"
Mr. A. D. Dayis, Vice President, Lincoln Electric Co., Cleveland
Paper: "Fundamentals of Production Welding"
Mr. H. J. Grow, Research and Engineering Dept., Air Reduction Co., New York
Paper: "Oxwelded Joint as a Mechanical and Structural Detail"
Mr. H. H. Moss, Linde Air Products Co., New York
Discussion on papers

Saturday, October 22

Paper: "Metallography of Arc Welds in Mild Steel"
Mr. Bissell, Westinghouse Electric Co., Pittsburgh
Paper: "Recent Improvements in Art of Thermit Welding"
Metal & Thermit Corp., New York
Paper: "Welded Steel Pipe for Distribution of High and Low Pressure Gas"
Mr. Louis Stein, Gas. Eng., Northern States Power Co., Minneapolis
Discussion on papers
Adjournment

HOLLUP ANNOUNCES AUTOMATIC WIRE

The C. H. Hollup Corporation, Chicago, Illinois, manufacturers of electric welding equipment and gas and electric welding rods and accessories, recently announced a new wire for automatic electric arc welding. Facilities have been arranged to coil the well-known Rex brand of electric welding wire into reels for use with automatic welding machines. This wire has a thin flux coating and is furnished in three grades, including commercially pure iron, mild steel and annealed low carbon steel. Stock sizes will be 1/16, 5/64, 3/32 and 1/4, but the manufacturers state that on special orders the 1/16, 3/32 and 5/32 sizes can be supplied for use with automatic welders.

...hods Held in the University of Minnesota. This Group Is Only a Part of the Number Who Attended This Three-day Session, Which Was the ... Well for Future Gatherings of This Nature at Thisand Other Engineering Colleges.

Seam Welding Oil Containers

Economical Production of High Grade Tanks Secured Through Carefully Arranged Use of Several Welding Processes in Combination

BY TAKING advantage of modern developments in electric resistance seam welding the Tokheim Oil Tank and Pump Company, of Fort Wayne, Indiana, is able to produce oil tight seams in 14-gauge sheet steel at the rate of thirty-six inches per minute, and in 16-gauge sheets at the rate of sixty feet per minute. This means rapid, economical production, but with the great advantage that the quality of the finished product puts it in the front line as merchandise.

This up-to-date plant produces a complete line of filling station and bulk oil storage equipment, factory storage systems and distributing systems. Such a variety of sheet steel produtcs gives rise to a correspondingly varied opportunity for welding, and a noticeable feature of Tokheim construction is that practically every permanent connection is a welded connection. Four welding processes are constantly in use here —electric spot welding, electric seam welding, oxy-acetylene welding and oxy-acetylene brazing—each process used on work for which it is considered most satisfactory. With four chances to weld every joint or seam there is little need for the choice of any other type of connection.

Through the skillful application of the welding processes this concern has secured for its products two advantages of prime importance, namely, sturdy construction and absolute freedom from leakage. The design of all the component parts of all the different articles is such as to favor the use of welding and get the best kind of a welded joint for the purpose intended and at the same time to get the proportion and distribultion of materials so ordered as to get the maximum use of their strength. An important aid to the uniformity of the product is the elaborate use of jigs in the preparation and assembly of the parts into the finished product. All parts are cut or punched from sheet material in the shop, then rolled or pressed to shape, assembled and tested, all to definite specifications and under careful supervision. Raw materials are subject to careful specifications and examinaton, and all new processes or methods are carefully tested and approved before being adopted as standard. Well lighted and well ventilated work-rooms make for comfortable working conditions which attract the services of the best class of mechanics and are influential in keeping down the labor turn-over.

The resistance welding equipment in this factory makes up an elaborate and also a very important department of this plant. The imposing looking battery of resistance welders includes one Type 3HDA Gibb Seam Welder, one Type 340-OH Gibb Seam Welder, two Type 60 Thomson Spot Welders and one Type 246 Thomson Spot Welder. The first mentioned seam welder has the roller electrode set parallel to the secondary lead and is used for welding longitudinal seams in both cylindrical and rectangular tanks. The other seam welder has the roller electrode set at right angles to the secondary lead and is used exclusively for welding in the bottoms of these tanks.

Fig. 1—Head and Shell of Tank to Be Seam Welded. Fig. 2—Set-up Used When Head Is Tacked to Shell on Spot Welder.

The production possibilities of such a complete resistance welding installation are better realized when it is noted that this factory turns out a number of different kinds of units and the majority of them call for work on at least one and in some cases several of the welding machines listed above. This is particularly true of the tanks, which form an important part of oil storage and dispensing equipment. A complete line of such equipment means tanks of many different capacities and different shapes. To get into economical production on these containers means that each one has to be studied by the plant superintendent in order that he may determine what operations on each item can be assigned to the different welding machines available.

A spot welding machine, for example, may be used to make a complete connection or finished assembly or it may also be used for tacking parts of an assembly together so that they will be held rigidly in place while a complete weld is being made on another machine. The seam welder may be used to advantage to make a complete joint or in the case of some rectangular shapes it may be necessary to use this for only a part of the seam, finishing the work with the oxy-acetylene torch.

Figure 1 is an illustration of a piece of tank work which can be entirely welded by the resistance welding process, the

spot welder being used to make some of the permanent connections and also to tack the shells together for the longitudinal seams and to tack heads on the shells before they are finished on the seam welders. In the illustration only the head and shell are shown. Figure 2 shows how the assembly is set up on the spot welder, the shell being pushed over the lower arm of a deep throated spot welding machine with the open end resting on a double roller to make a rigid setting and at the same time facilitate the turning of the tank. With this arrangement a series of spot welds soon makes a permanent connection between the head and the shell. The bottom is inserted with the concave side outward and brought up to the machine as shown in Figure 3. The top end of the tank is held by a roller support suspended from the ceiling. This arrangement

Fig. 4—Testing Finished Tank with Air Pressure and Soapsuds.

makes it a simple matter for a single operator to handle the seam weld in the bottom of the tank. After brazing a pipe connection to the head, the tank is tested and if there are any defects in the seams they are quickly repaired by means of the oxy-acetylene torch. After passing inspection they are finished with a coat of dark enamel over which is applied a coat of high grade spar varnish.

The type of seam welding machine used for this work is very similar to a heavy duty spot welder in appearance. There is this difference, however, that the pointed electrodes of the spot welder are replaced by two copper discs between which the lap edges of the seam to be joined are placed. Seam welders of this type are equipped with a device which automatically turns the current on and off during the operation, producing a series of interruptions of the current without interruption of the continuous motion of the copper discs. In case different thicknesses of metal are used on different products of the same plant the speed of these rolls can be adapted to the thickness of the metal by changing the gears which operate this top weld. This is an illustration of the flexibility of many of the resistance welding machines now on the market. Many of them are built for a specific job but most of them have a fairly wide range of work and consequently the varying requirements of a factory can often be made by simple changes in the equipment. It is essential to good results that the men in charge of such equipment take pains to make these adjustments when necessary. On very light stock operators have to be careful to study their machines and learn how to put the correct pressure on metals of different thicknesses. In the work illustrated the stock is 14-gauge and 16-gauge sheet and on account of the heavy pressures needed for this work the machines which have been installed are so constructed that the welding head is brought down to and away from the work by air pressure. On stock of this thickness it is imperative that other means than the usual foot pedal be used for this operation. The efficiency of the equipment has been further enhanced by eliminating unnecessary contacts from the secondary to the lower welding wheel, by improvement in the water cooling device, by equipping them with large welding wheels and large bearings, and providing motors and driving mechanisms of sufficient capacity to insure continuous operation without signs of strain. Particular attention has also been given to provision for easy adjustment for the different welding pressures required by different thicknesses of metal and the need for compensating for the wear on the welding wheels.

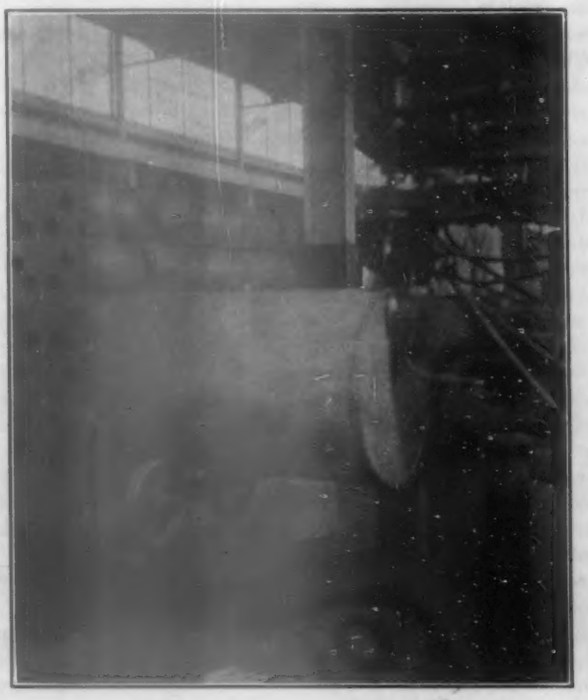

Fig. 3—Seam Welding Bottom to Shell.

Obviously the use of welding in the construction of oil containing equipment is for the purpose of obtaining an absolutely leak-proof joint. These tanks, therefore, have to be tested for tightness before being sent to the finishing room. Figure 4 shows one of them being tested after leaving the welding department. The openings in the top are closed and air pressure is applied through one of the closing plates. The man in charge of the testing goes over all seams with a brush dipped in heavy soap suds and marks all spots where bubbles appear. These spots are repaired.

The application and use of welding in the Tokheim plant is an unusually fine example of good results that can be secured where equipment for different welding processes is available and kept in good condition and each process is used wherever its operations work to the best advantage. The production rate is increased, the welds are all made of the best quality for the purpose indicated, and where each welding operator specializes on a particular type of operation, as is usually the case in this plant, the uniformity of results can be almost taken for granted. This layout might well serve as a model installation for sheet metal fabricators who desire to get the best possible use out of the welding processes in the manufacture of their products.

POWER SHOW STIMULATES MECHANICAL DEVELOPMENTS

The phenomenal growth of the annual National Exposition of Power and Mechanical Engineering is an accurate measure of the tremendous advances in the development of mechanical power generating and using machinery. The sixth in the series is to be held at the Grand Central Palace in New York during the week commencing December 5, 1927, paralleling the great annual meetings of The American Society of Mechanical Engineers and The American Society of Refrigerating Engineers. Four floors of the Palace will be completely filled with interesting showings of the latest mechanical devices. Over 500 exhibitors are participating and their exhibits will cover a wide range. Heat and power generation will occupy a large section with displays of boilers, stokers, furnaces, superheaters, valves and all the other accessory devices that are essential to the economical generation of steam. There will also be equally interesting showings of heating and ventilating equipment, refrigeration machinery, power transmission devices, machine tools, welding equipment, woodworking machines and a comprehensive section of instruments for measuring and recording time, pressure, volume, gas and air flow, temperature and, in fact, all of the variables that the engineers in industry must control. The Exposition will be a complete mechanical show.

In scope, size, value of exhibits, attendance and influence on industry the coming event will be an important factor in the future development of industry. Over 100,000 visited the 1926 show and the 1927 event is sure to attract a much larger crowd. Compare it with the first show in 1922 when about 150 exhibits occupied only one floor and the attendance was only about 20,000. The first show was a success, however, and when the second one filled two floors and attracted a larger attendance, the "Power Show," as it was known, became an established fact as an annual clearing house for the newest and best in power machinery. In the past three years the Exposition has broadened in scope and it is now much more than a power show. It may rightly be called a "Mechanical Show" as it includes mechanical equipment usable in many industries and the executives and engineers in those industries attend it and profit greatly.

Expositions perform a most useful function in modern industry. In essence, they are old institutions perhaps developed from the old live stock and produce markets through the annual bazaars and fairs set up by itinerant merchants in the early days of merchandising, before modern mechanical transportation brought changes in business methods. They still form a convenient means of bringing the buyer and seller together and an important criterion of their success is the amount of business the exhibitors do. They come and go as the needs for them develop. Their success is a measure of the success of the industries they serve. It may seem strange in this modern age of high speed transportation, communication and high-pressure salesmanship that they still prevail as a means of stimulating business. They offer the advantage to the visitor of being able to compare competing devices and consult with the experts of competing organizations with a minimum of travel and lost time. They certainly stimulate manufacturers to the development of new products. They also serve a higher purpose in that they offer advantages of a liberal education in the products shown. All of the 100,000 who passed the gates at the last mechanical show were not potential buyers but most of them carried away a new conception of machinery or new ideas which they could use and the show was a worthwhile thing to all of them.

ADVANTAGES OF WELDED STEAM PIPING REVIEWED

The following paragraph from an article on power piping in a recent issue of Power Plant Engineering speaks for itself as evidence of the recognition welding is receiving in this field wherever it has been given a chance to prove its economy and efficiency:

"Rapid development of high pressure underground steam lines as existing today has been greatly influenced by the reliability of the butt welded joint. It has eliminated the necessity of burying fittings, flanges and couplings, and has made possible the use of higher temperatures and superheat with security. With proper care to see that the welding penetrates through the walls of the pipe and that the top of the weld is reinforced not less than 10 per cent of the thickness of the pipe wall, 100 per cent welds can be made."

ELECTRIC ARC WELDED PIPE TESTED IN THREE POSITIONS

Tests of arc welded joints in 6-inch steel pipe, conducted by A. G. Bissell, General Engineer of Westinghouse Electric & Manufacturing Co., are described in a recent issue of The Oil and Gas Journal.

The pipe samples to be welded consisted of 12-inch lengths of standard 6-inch pipe. The ends to be welded were beveled 60 degrees, leaving approximately one-sixteenth-inch shoulder between the bottom of the bevel and inside of the pipe. The opposite ends of the pipe were threaded for standard pipe coupling. The welding was done in two layers, the first layer being well brushed with a stiff wire brush before the second layer was applied.

No. 1. One set of welds was made on samples of this pipe, joining the sections by doing the welding in a flat down hand position and rolling the pipe as the welding progressed.

No. 2. A second set was made using the same size pipe, secured in a vertical position and the weld made on the horizontal seam around the pipe, which was held stationary.

No. 3. On the third set the pipe was held rigid in the horizontal position. In this case it was necessary to weld the pipe in the flat, vertical and overhead position.

On tensile strength tests, the first set developed an efficiency of 96.25 per cent of the strength of the original pipe. The second test, the vertically welded pipe, developed a tensile strength of 90 per cent, and the third or horizontal test specimen developed an efficiency of 95.75 per cent.

There was one or more of the strips from each set that broke outside of the weld, so for the basis of computing the efficiency of the joint this tensile strength was taken as the strength of the original pipe.

Caps were made for blocking off one end of the standard couplings by arc welding a disc into them. With one of these caps on each end of the welded specimen a hydraulic pressure of 550 lbs. was applied without any signs of leakage at the welded joints. By maintaining a hydraulic pressure of over 100 lbs., a specimen from each set of tests was subjected to a crushing pressure at the welded joint, with the pipe between two 2½-inch bars. The screw joint at the end caps began to leak badly long before the joint had been appreciably deformed, finally leaking so badly that further crushing had to be abandoned. In two cases the pipe without water in it was crushed, and it was found that the pipe welded in the vertical position was crushed from its original diameter of 6⅝ inches to a diameter of 2¾ inches, using a pressure of 35,000 pounds, before the weld showed any sign of cracking.

CLEVELAND SECTION HAS GOOD PROGRAM OF PAPERS

At the October meeting of the Cleveland Section of the American Welding Society, held Friday evening, October 27th, the subject of arc welding as a manufacturing tool was presented by Mr. J. F. Lincoln of the Lincoln Electric Co. Arrangements have been made for regular meetings on the second Thursday of each month following and papers have already been arranged for covering the following topics: "Underwater Cutting", "Welding as an Ideal Method of Fabrication" and "Welding in the Airplane Industry."

Welding Pressure Vessels*

Examples of Products in Service Which Show Dependability of Welding and a Few Tests to Show the Sort of Research Work Back of These Products

By T. McLean Jasper†

WELDING as a means of joining metal has developed to a point which has not only attracted the attention of engineers and fabricators of metal, but has become one of the chief methods whereby metals can be safely and economically joined.

In a manner similar to that which marked the development of the steam engine, processes for welding have gone through various stages of grief and uncertainty until today the principles underlying good welding results are very generally understood.

The fundamentals of good welding may be briefly stated as follows:

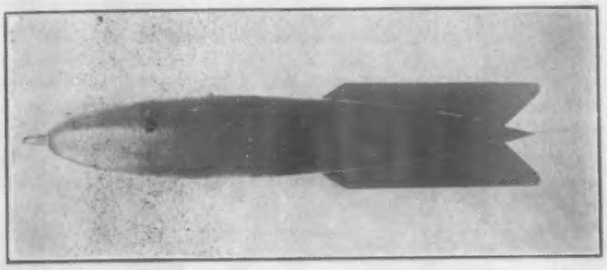

Fig. 1—Welded Aerial Bomb.

1. A complete fusion of the deposited metal with the metal joined.
2. The elimination of the oxygen and nitrogen of the atmosphere from contact with the hot deposited metal so as to avoid their embrittling effects on such metal.
3. The elimination of the overheating effect on metal adjacent to the weld so as to keep the weld and adjacent metal in metallurgical equilibrium.
4. The elimination of the personal element in welding main seams thereby tending toward a uniformity of product which insures consistency in results.

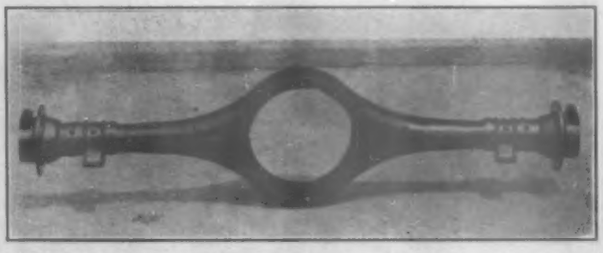

Fig. 2—Rear Axle Housing.

The requirements of a material to be used in welding to join two plates together are that it shall have very similar physical and chemical properties as the metal which it joins. These requirements are especially necessary in cases where corrosion plays an important factor in the product obtained. It has been generally thought that welding was necessarily associated with brittleness in the weld material and overheating of the metal adjacent. However, it is now known that these things are not necessary but are only a phase of welding which with proper care can be entirely eliminated. It is true that in many cases welding produces a brittle joint, but in each method of welding it is believed that ductility, strength and homogeneity are obtainable through the exercise of proper care.

The successful joining of plates by welding has been made consistently possible by the development of automatic metal depositing devices and by protecting against the embrittling elements which readily enter into hot metal when unprotected.

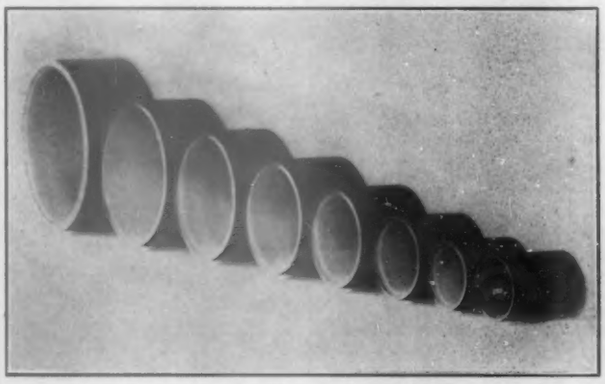

Fig. 3—Oil Well Casing Couplings.

With great care the above results can be obtained by hand methods, but since the human being yields to fatigue and cannot be adjusted to run indefinitely like an automatic machine, hand welding requires that greater precautions shall be exercised in order to produce the best results.

As a body of men charged with the protection of industry and the lives of people using high pressure and high temperature equipment for power and other uses, it is highly necessary that you acquaint yourselves with the latest methods of joining metals and that you get some idea of the possibilities when welding is properly performed.

Fig. 4—An Arc Welded Pressure Vessel.

As higher temperatures and higher pressures are continuously being demanded in order to increase the economies in mechanical engineering and chemical engineering technology, so must the

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*Paper read before the annual meeting of the National Board of Boiler and Pressure Vessel Inspectors, Nashville, Tenn., June 15, 1927.

†Director of Research, A. O. Smith Corporation, Milwaukee, Wis.

methods of joining metals be modified and improved so as to produce the designs most suited to such development.

For higher temperatures and higher pressure work and for the production of chemicals of various kinds, leak proof containers of great thickness and size and of various metals are required. Welding offers a means for producing vessels of size and shape hitherto unattainable by any other method and in metals of different compositions to suit the needs of various special industries.

The old saying that "large oaks from little acorns grow" is

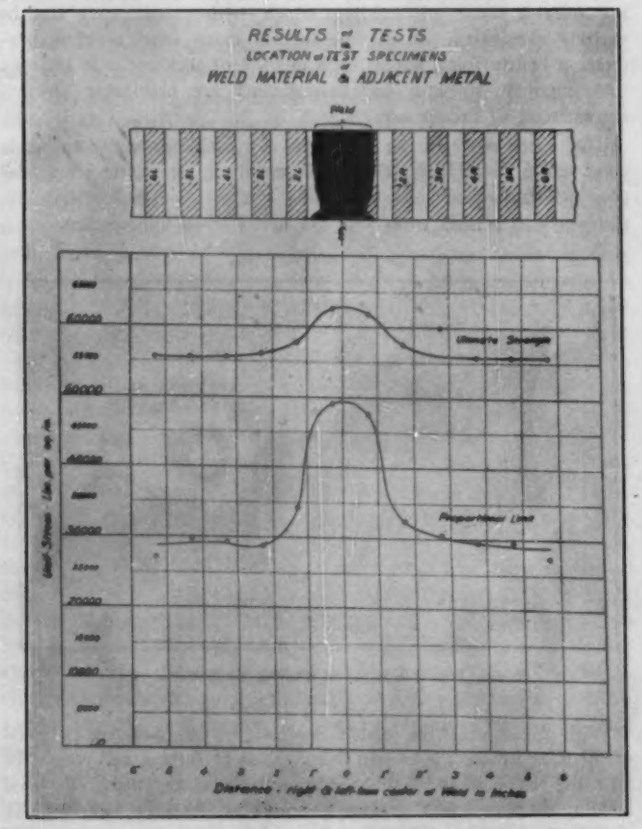


Fig. 5—Tests Show How Strong Weld Materials Can Be Made.

abundantly proven in the development of one particular process of welding which the author is familiar with.

Toward the end of the war large aerial bombs were built requiring a strength of weld equal to that of the parent metal and a ductility such that the bomb would explode into small pieces rather than along the seams. This required at least one hundred per cent weld strength that would not crack at the seams when the bomb exploded due to the weld being brittle.

Later rear axle housings for automobiles were made by arc welding and the demands against fatigue and load required at least one hundred per cent strength factor with sufficient ductility and a proper balance in the weld to protect the structure against the insidious effects of repeated loading. Today over 2,500 miles of housing arc welding have been built, representing over two and one-half million housings, and a service failure has yet to be heard of.

The next step in arc welding was that of the casing couplings which are used in oil wells, which not only require the weld to conform to strength and ductility factors comparable to the parent metal, but, in order to compete in production, equal machinability and density were necessary. One other element crept into this product which is most essential when corrosion becomes a factor and that is the necessity of producing a weld of the same electrical potential value as that of the parent metal, so as to balance the corrosion effects between the weld and the parent metal. Today over one and a quarter million of such couplings, varying in size from 4¾" to 21¾" and in thickness from 7/16" to 15/16" are in the ground doing service, and a service failure has yet to be heard of.

Such results, however, are not produced by chance but are obtained after much research and considerable testing. It was early recognized that the ordinary low carbon steel did not give the best results in strength and ability to resist corrosion, and research leading to the selection of the best balanced metals for work of a particular nature was carefully gone into.

The next step in the growth of the figurative acorn into the sapling and the full grown oak was in the realm of large vessels

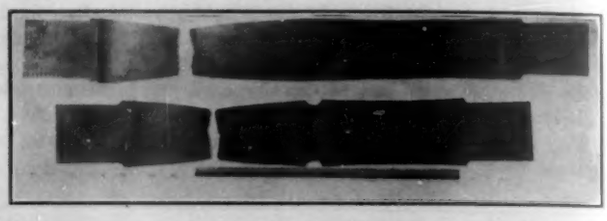


Fig. 6—Showing Ductility in Weld.

for use at high pressures and high temperatures. The application was made in one of the most hazardous businesses yet attempted by man, that of the oil cracking business, where a failure in service means the lives of many men and the loss of much property. To most people unfamiliar with the electric arc welded pressure vessel for oil cracking and who do not see back of it the nine or ten years of strenuous development in the laboratory and in service, a test system which tries metal severely and searches out the weak spots of the process, the application of arc welding to this most severe service seemed foolhardy. One manufacturer has today in the field over 500 arc welded vessels of large size working at temperatures up to 900° F. and at pressures up to 600 lbs. per square inch at those temperatures. These vessels vary in weight from 100 to 230 tons each. A service failure in those arc welded vessels has yet to be heard of.

Today the largest high pressure vessel ever built is working

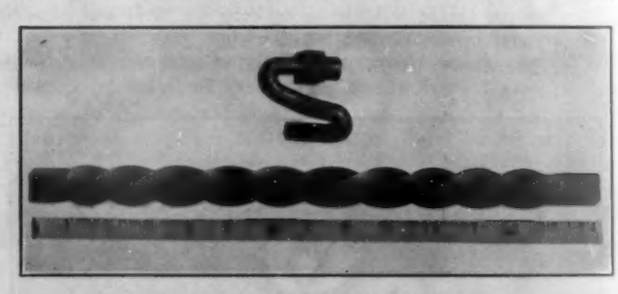


Fig. 7—Further Evidence of Ductility.

at near 900° F. and weighs over 260,000 pounds. This is an arc welded vessel.

A vessel is under construction by arc welding which will weigh, when completed, 380,000 pounds and will operate at a temperature of 900° F. The size and weight of such equipment are curtailed only by the facilities for shipping and erection. Special cars have to be obtained and special routes selected for the transportation of such equipment.

To the audience this may appear as a fairy story. To the author it appears as a realistic piece of the most excellent engineering development he has ever come in contact with. This can be said without self praise, because he has had practically nothing to do with this development.

Figure 1 shows the acorn, Figure 2 is the shoot, Figure 3 shows the sapling, and Figure 4 the oak approaching maturity.

(Bomb, Housings, Couplings, Large Vessel.)

This address to you would be incomplete if the results of tests were not presented. The tests here presented will apply to the

metal used in the fabrication of vessels, such as the members of the National Board of Boiler and Pressure Vessel Inspectors are most interested in. They apply to carbon steel having a yield point of from 30,000 to 35,000 lbs. per square inch and an ultimate strength of from 55,000 to 60,000 lbs. per square inch when metal from two inches to six inches in thickness is considered.

Figure 5 represents test results on a series of slabs cut from a 2⅝-inch plate which had been made by arc welding two pieces together. The slabs were cut parallel to the weld and so arranged that the results represent the strength values at each ½-inch point on either side of the center of the weld and for a distance of six inches from the center of the weld.

It will be noticed that the weld strength is about 12 per cent greater than the plate strength. One other matter should be noticed which is that the strength at a point immediately adjacent to the weld is stronger than the plate material. This is due to the heat treating effect of the welding process. These results are consistently found when the correct balance is obtained between the metal joined, the weld material and the condition governing the welding process.

Figure 6 represents two test specimens which have been cut at right angles to the direction of those shown in the above experiment, and in this case from a plate 3⅝ inches thick. The weld section is at the center of the test specimen. The section in the center of the weld of the lower specimen shown in Figure 6 was reduced by using a ½-inch milling tool.

It will be noticed that the shoulders of the reduced section has been elongated to ¾ inches, and that the fracture occurs about 4½ inches from the center of the weld. These facts show a degree of ductility in the weld not generally considered possible and also that the welding process does not create a weak section immediately adjacent to the weld. Test specimens when the section at the weld is not reduced too much consistently break half way or nearly so between two strong sections, that is between the grip section, which is thicker, and the weld section, which is stronger. The upper specimen shown in Figure 6 is longer and with no reduced section at the weld. The fracture occurs about 5½ inches from the center of the weld. The fracture in this case is again about midway between the weld and the grip section. These two specimens show that the weld has not affected the point at which fracture occurred.

Figure 7 represents two bars which were cut out of the heart of a weld and parallel to its axis. The specimens were bent and twisted cold and show the extreme ductility of the deposited weld material.

Figure 8 shows test slabs cut from a six-inch plate which had been arc welded. The slabs are each ¾ inch in thickness. The section of the weld in each successive plate has been reduced by a progressively increased number of 0.2-inch holes. The weld did not fail when five such holes had been made, reducing the cross section by 16 2/3 per cent. When the section had been reduced by 23 1/3 per cent the weld failed. The strength of the steel plates was 55,000 to 57,000 lbs. per square inch, and that of the weld over 20 per cent stronger. The failures in the plates occurred about 4½ inches from the center of the weld.

There is no intention of welding plates together to produce a weld unnecessarily strong because in doing so ductility is sacrificed and no useful purpose is thereby served.

Three other items of interest. Long time temperature tests show the weld material consistently stronger than the plate material for all temperatures tested which range up to 900° F. Corrosion results from high temperature and high pressure vessels using very corrosive crude and gas oils also show that the weld is consistently no more corrosive than the metal joined. Laboratory corrosion results also show that the metal used in the process described above is less corrosive than the ordinary eight to twelve carbon steel used in many vessels.

The results represented above are not special cases but represent the steel and process which has gone into ordinary fabrication procedure on all vessels which have been built by the methods represented by the above test results. This also represents a material most excellently suited to boiler and pressure vessel construction which you very properly consider to come within the jurisdiction of the members of your association.

It might be of interest for you to know that results similar to those already represented are being obtained in the joining of many non-corrosive and special alloy steels.

It is believed that welding in the future will assume even greater

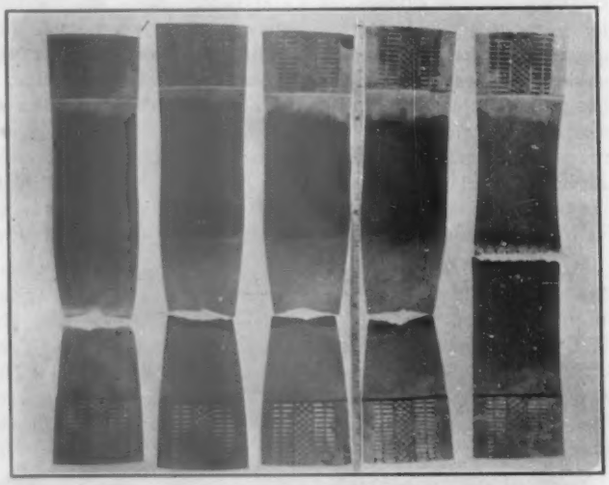


Fig. 8—Section Was Reduced 23% Before Weld Failed.

and greater responsibility for the joining of metals. The Boiler Code at the present time does not allow of its use for steam boilers to carry the main load. Welding is being used simply as a means for the elimination of leaks. However, it is felt that it is simply a matter of time until the Boiler Code Committee will recognize its value and will outline the proper safeguards for its use.

WELDING SHOP BOOSTS BUSINESS BY CONSISTENT ADVERTISING

A very productive advertising campaign has been put to work by the Storts Welding Co., Meriden, Conn. Their series of letters, broadsides and special mailing lists featuring their work on boiler welding, reaches 900 general manufacturers in Connecticut, and the entire campaign has been pushed energetically to counteract the general prejudiced opposition to boiler welding in certain quarters. In a recent letter, Mr. Tierney of the Storts Company says, "With all this opposition, we find it is a profitable promotion to consistently keep the welder's 'say so' before the manufacturer's vision. You will note that we use 'the inspector' as the abstract avenue to our concrete points."

The total cost of the series of four mailings, one of which goes forward every three months, is 35c a prospect. Alternately with these pieces they also send out special literature on welding subjects. They have continued this practice for over two years and found the returns highly profitable.

Among other effective pieces of Storts advertising is a four-page sheet entitled "The Practicability of Boiler Welding as the Boiler Inspector Sees It," which sets forth the objections to welding raised by inspectors, and then proceeds to show how those objections are being overcome every day by welders in this shop.

One original idea which has been productive of results is a pair of file cards which are made to fit a 3 x 5, 4 x 6, or 5 x 8 file. On the tab of one card is printed "Welding," on the other, "Tanks, Welded Steel," and each card tells concisely the wide variety of work the shop is equipped to perform. These cards are kept for ready reference in the files of a large number of plants in the territory served.

TWENTY-EIGHTH CONVENTION OF INTERNATIONAL ACETYLENE ASSOCIATION

Chicago has, for many years, been chosen regularly as the annual meeting place of the International Acetylene Association, an organization with headquarters at New York City and numbering in its membership the manufacturers of carbide, acetylene and apparatus for its commercial use, throughout the world. Since the discovery and perfection of methods for producing carbide of calcium on a commercial basis and methods for using the wonderful properties of this compound, this organization has, by cooperative effort, contributed many valuable processes to the industrial world. At the same time, it has worked closely with insurance and regulatory bodies to move all hazard from the handling of these products and the use of them in our most important industries. The Twenty-Eighth Annual Convention of this Association will be held in the Stevens Hotel, November 16-17-18. The program of topics for discussion indicates the great influence of this industry.

Mr. S. M. Hastings, president of the Illinois Manufacturers Association, will deliver the address of welcome on Wednesday morning, November 16th, and response will be made by Mr. F. E. Rogers, of the Air Reduction Sales Company, New York City. The keynote address of the convention, entitled "The Acetylene Industry and its Future," will be delivered by Professor H. E. Lemon of the University of Chicago. This will conclude the opening session.

Wednesday afternoon session will be a joint meeting of the International Acetylene Association with the Gas Products Association, an organization of manufacturers of compressed oxygen, with association headquarters in Chicago. The widespread use of oxygen in connection with acetylene gas in the metal working industries gives these two associations a bond of common interest, which makes this particular session an important part of the program. The first question to be discussed will be: "When does standard equipment become non-standard?" Mr. H. S. Smith, of New York City, will lead the discussion. This will be followed by a paper on the "Status of the Acetylene Industry," by Mr. Stuart Plumley, secretary of the Gas Products Association, who has been identified with the acetylene industry almost from its beginnings. Another paper of important value to those who use acetylene for welding will be presented by Mr. H. E. Whittemore of the Bureau of Standards, who will describe methods of testing welds which are employed in the Bureau of Standards Laboratories. Mr. Herbert Thompson will present a paper entitled "The Record of Carbide and Acetylene in Transit." The meeting will close with the showing of the movie film the Gas Products Association to assist members in explaining the principles and uses of the oxy-acetylene process to industrial groups.

On Thursday morning a report of the consulting engineer for the Association, Mr. J. I. Banash of Chicago, will put on record the research activities of the past year. This report will be followed by two papers dealing with the comparative merits of city gas and acetylene gas in the oxy-acetylene cutting process. This subject has been made the basis of shop tests and research laboratory tests. A representative of the Union Carbide and Carbon Research Laboratories will present a laboratory study of the question and Mr. J. L. Anderson of the National Carbide Company, New York City, will present a discussion of the question as it appears under actual shop conditions. Following these interesting papers, Mr. Thomas F. Hanley, Jr., will describe the use of oxy-acetylene welding in fabricating the complete pipe system which was installed in the Dyche Stadium in Northwestern University. The concluding address of the afternoon program, by Mr. S. J. Williams of the National Safety Council, of Chicago, will deal with the safety aspects of acetylene.

The afternoon meeting Friday will be devoted to some of the more important applications of the oxy-acetylene process. S. W. Miller of the Union Carbide and Carbon Research Laboratories will present a paper on "Welding Brass and Bronze." Mr. H. E. Rockerfeller, of New York City, will describe the welding of some large pressure tanks. Many industrial executives and regulatory bodies consider that such welding is questionable from a point of view of safety. The present discussion is for the purpose of indicating how such welding can be made perfectly safe and thus give to industry a method of taking advantage of the economies offered by the substitution of welded joints for old-fashioned methods of construction. The remarkable strides made in aviation by this country are due in no small measure to the excellent production practices of airplane manufacturers and, in turn, most of these manufacturers are now using metal structures which call for a great deal of welding in the construction program. The subject is of such timely interest that the paper entitled "Welded Airplane Construction," by Mr. R. M. Mock, technical editor of Aviation, New York, will be well received. The consulting paper on the Thursday afternoon program will be entitled "Mechanical Testing of Welds," by W. B. Miller, New York City. These discussions of testing methods indicate how far the International Acetylene Association has gone in collecting data to assist the users of their products in maintaining a high standard of results throughout their work.

On Friday morning, Mr. W. H. Dreis, of the Dreis and Krump Manufacturing Company, Chicago, will present a paper entitled "Economy of Production Cutting, Revising Old Shop Methods." The paper will prove to be a valuable exposition of the economies secured in shops where every advantage is taken of developments in metal working methods. Following this paper Mr. T. W. Green, of the Linde Air Products Company, New York City, will speak on the latest aspects of bronze welded cast iron pipe, a subject which is of great interest to gas companies throughout the country. Mr. W. A. Lacke, master mechanic of the Pullman Shops, Pullman, Illinois, will describe the gas welding and cutting operations in the Pullman Shops.

Friday afternoon will be devoted to receiving committee reports and election of officers, and the annual banquet of the Association will be held Friday evening in the Stevens Hotel.

WETZEL TELLS ARCHITECTS ABOUT WELDING

The firm of Smith & Oby, 6107 Carnegie Avenue, entertained a group of the Cleveland architects, heating and ventilating engineers, at their plant plant, on Thursday evening, October 27th.

Mr. H. E. Wetzel, Jr., who has placed many interesting papers before various technical societies all over the country, gave an interesting talk on recent developments on the installation of high and low pressure heating systems.

Mr. Wetzel showed slides of work for his firm as recently done on the new St. Louis Hospital in Cleveland, and the new Ohio Bell Telephone Building in Cleveland. Preceding the showing of the slides and the presenting of Mr. Wetzel's paper, a splendid dinner was served.

Men like Mr. H. E. Wetzel, Jr., who by the way, is a graduate engineer from the Ohio State University, undoubtedly are doing a great deal to spread the gospel of welding among other engineers. His message comes not as from a man who is interested in sale of apparatus or wire but comes as an inspiration; he believes without any question of doubt, that welding is the ideal method of pipe fabrication.

Gas Welding Galvanized Tanks

Production Methods Which Make It a Simple Matter to Keep the Finished Article up to Standard

A RECOMMENDATION for the dependability of gas welded seams is seen in the practice of a manufacturer of underground storage tanks who uses oxy-acetylene welding throughout in the assembly of these containers. As these tanks carry a guarantee it is necesary that the keynote of the

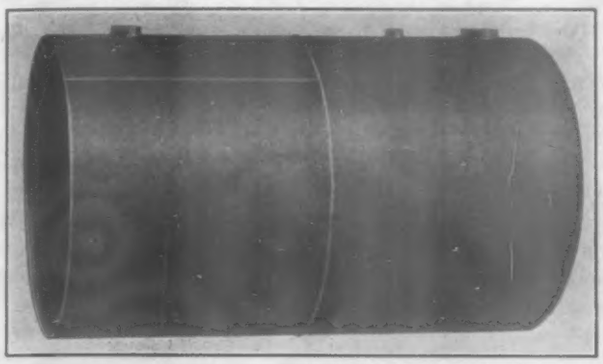


Fig. 1—Finished Appearance of Welded Tank of Galvanized Iron.

workmanship contained in them be good production rather than cheap production. A systematic method of handling the work of production coupled with the use of many practical and time saving shop helps make it possible to turn out these storage tanks at a reasonable price, perfect in construction and of maximum strength and durability. A system of welding has been perfected here which not only simplifies the job of assembling but results in a homogeneous construction in which the strains are equalized and the resulting tank is as strong as it looks. Figure 1 gives a general idea of the appear-

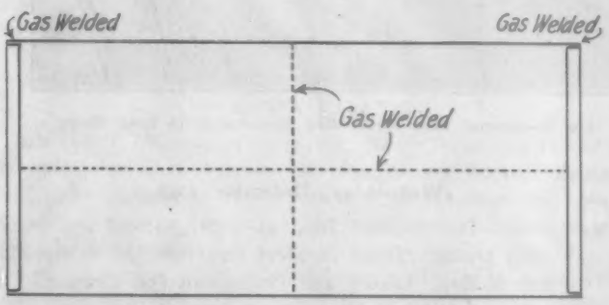


Fig. 2—Details of Welded Assembly.

ance of the finished tank and Figure 2 indicates the welding procedure followed.

Tanks to this pattern are made in capacities varying from two to eighteen barrels; the material is heavily galvanized open hearth steel 16-gauge, 14-gauge and 12-gauge according to the size of the tank.

As indicated in Figure 2 the shell of the tank is of two-piece construction. The first operation in manufacture is cutting sheets for half the shell and rolling to shape. The edges to be joined are then clamped together in the large jig shown in the foreground in Figure 3. To the left of this can be seen a rear view of a duplicate of this jig which is used for the same purpose. This jig is the well-known slotted bar design, and permits rapid manipulation of the torch along

Fig. 3—Jig Used When Making Longitudinal Seams in Shell.

the seam, while the expansion and contraction effect are taken care of by the method of clamping.

After two parts of a shell have been welded longitudinally they are ready to be joined by a girth weld. In preparation for the complete girth seam the two halves of the shell are

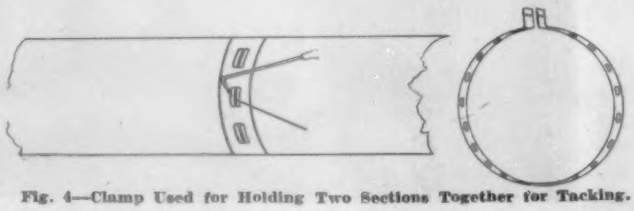


Fig. 4—Clamp Used for Holding Two Sections Together for Tacking.

first tacked together using two-inch tacks on twelve-inch centers. To hold the two parts together for tacking, a slotted band as shown in Figure 4 is used. This band is adjusted so that the slots are centered over the seam and then drawn

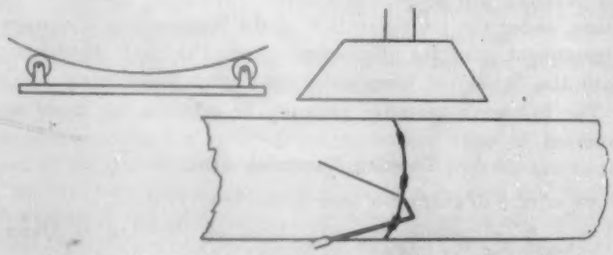


Fig. 5—After Tacking the Girth Seams Are Readily Welded.

tightly together with bolts. As soon as all of the tacks have been made the assembly is mounted on rollers and the welding of the girth seam is then carried on continuously (Figure 5). The filler material used for this welding is a ⅛ inch diameter

copper coated mild steel welding rod. The acetylene is supplied by a piping system from an outside generator house and oxygen is supplied from tanks installed at each welding station.

After the girth seam has been completed the heads are

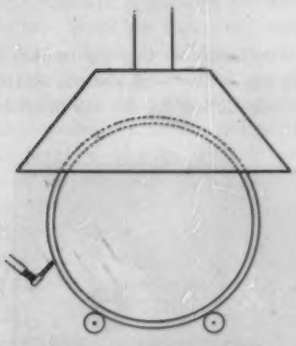


Fig. 6—The End Seam Is Made Without Use of Filler Rod.

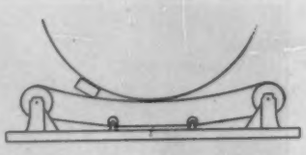


Fig. 7—Type of Roller Used in Heavy Tanks.

set in and the flanges fused together with a welding torch as shown in Figure 6. No filler rod is needed for this operation. The final welding operation is the attachment of pipe connections, for which the bronze welding rod is used. The tanks are then tested carefully and when they have been determined to be free from leaks are given a heavy coating of asphaltive paint.

The devices shown in the illustrations are very simple and can be made at very low cost. Similar devices are in use in practically all tank manufacturing plants where welding has been thoroughly systematized. Figure 7 for example, shows a larger and heavier set of rollers used in the construction of tanks of much heavier material. In this case a loose belt is run over one set of rollers and under another so that the tank lies in a sort of cradle. This makes it easier for a single operator to control the movement of a large heavy tank and after it has been moved to a new position it can be held rigidly by slipping a small block of wood between the tank and the belt as shown in the sketch.

Another noteworthy feature of the equipment of this plant is the ventilation system installed for the work on galvanized metal. As the welding frame burns off the zinc the fumes are apt to be disagreeable and more-or-less unhealthy. Consequently a very complete ventilating system has been installed as shown in Figure 8, and powerful fans draw off the fumes during the welding process so that the operator is not bothered by them in the least. Figure 3 shows the construction of the ventilating system over the jig which is used for welding the longitudinal seams. Figure 9 is a general view of the plant with a few of the welding stations ready for operation.

Fig. 8—Ventilating Hoods Carry Away Disagreeable Fumes.

Fig. 9—General View of Welding Department in Tank Shop.

PROGRAM ANNOUNCED FOR THIRD PURDUE CONFERENCE

On December 13, 14 and 15 the third annual Conference on Welding will be held at Purdue University, Lafayette, Indiana, under the joint direction of the Engineering Extension Department, and the Department of Practical Mechanics, with the School of Chemical Engineering cooperating.

The following tentative program of subjects has been announced:

Tuesday, December 13th.

10:00 a. m.—Registration and Inspection Trips.

1:30 p. m.—Opening Session: Uses of Welding in Manufacturing Operations.
(a) Electric Weld.
(b) Gas Weld.
Exhibits and Demonstrations.

7:30 p. m.—Latest Developments in Thermit Welding. Exhibits and Demonstrations.

Wednesday, December 14th.

8:30 a. m.—The Welded Joint as a Mechanical and Structural Detail. Study of Steel Structures by Microscope and X-Ray. Theory and Practice of Gas Cutting. Exhibits and Demonstrations.

1:30 p. m.—The Welded Joint in Structural Work.
(a) Electric Weld.
(b) Gas Weld.
Replacing Castings by Means of Welded Frames. Exhibits and Demonstrations.

6:30 p. m.—Informal Dinner. Memorial Union Building. Illustrated Lecture and Demonstration.

Thursday, December 15th.

9:00 a. m.—Resistance Welding and Its Application to Welding Thin Plates. Researches in Heat Treating Welded Joints in Cast Iron. Welding Rods. Exhibits and Demonstrations.

All meetings will be held in the Michael Golden Shops.

WELDED PIPE LINE CONSTRUCION GROWING IN CALIFORNIA

The use of welded pipe lines has spread throughout the gas industry on the entire Pacific coast until this type of construction has practically superseded every other type on lines larger than two inches in diameter. William Moeller, Jr., general manager of the Midway Gas Company, writing in the Oil and Gas Journal, points out a number of factors which their experience has shown must be considered in order to insure success of the welded line. This subject has been covered before in detail in The Welding Engineer but some of the main points deserve reviewing because of the great importance of correct procedure in pipe work.

The forty-five degree bevel, with a 1-16 inch straight face at each end, has been found to give the best results. It is essential that good welding material and experienced welders be used and that the work be rigidly inspected. A plan that requires each welder to mark his work with an identification mark helps toward better workmanship. Paying welders on the basis of the number of welds made each day is not recommended.

If proper precaution is taken during construction to make "tie-in" welds early in the morning and to refill the trench in the early part of the day, it should not be necessary to install expansion joints except at such places as railroad or bridge crossings where there are liable to be excessive contractional strains, and also on one side of each main line valve.

In pipe lines of larger diameter, it is economical to use valves of a smaller size than the size of the line, as, for instance, a twelve-inch valve may be installed in a sixteen-inch high pressure line with practically no loss in pressure. Good judgment must be used, however, so as not to carry this practice to extremes. Experience indicates that it is better to use too many rather than too few main line valves. The loss of gas, time, and revenue in case of line break may exceed in value many times the cost of the extra valve.

The preliminary test, before "lowering in" should be made on isolated sections of a mile or less, at 100 pounds air pressure, with the loss in pressure recorded over a ten-hour period. After the construction work is completed, a final pressure test is made at the maximum working pressure. There must be no loss in pressure, as shown by a recording gauge, during twenty-four hours. Where high pressure lines are laid along main highways a hydraulic test is recommended, to eliminate the hazard should a failure occur if air or gas were used to make the test. Pressures as high as 1,200 pounds for gasoline lines have been safely used in such hydraulic tests.

A DEVICE FOR PREVENTING PEAKS IN POWER LOADS

Edward T. Moore, of Syracuse, New York, has recently put on the market a device called a "power demand limitator." The purpose of this device is to reduce excessive peaks on electric power systems. The reduction of peaks is secured by interrupting for a few moments one or more of the power consuming units in a customer's plant. It is claimed that such a device can be used in connection with electric arc welding and electric resistance welding installations. In this case the device would be arranged so that some other electric equipment in the plant would be selected to reduce the load so that there would be no interruption of the welding current itself.

BETTENDORF OXYGEN PLANT GETS FINE SEND-OFF IN LOCAL PAPER

In a recent issue of the Chamber of Commerce News, Bettendorf, Iowa, appears a splendid article describing the growth and service of the Bettendorf Oxygen-Hydrogen Company. It tells how in twelve years this company has built up its output to twelve times its initial production. The article is illustrated by a view of the welding department in the plant of the Bettendorf Company, with the welders at work on side frames.

WELDING GOGGLES*

THE welding goggle is relied upon to supply what may be termed physical protection. This covers that class of occupation requiring as a primary feature the protection of the tissue of the eye from harmful energy emitted by hot bodies upon which or with which an industrial operation is being carried out. This protection is required by furnace workers, welders, and those employed in the immediate vicinity of such operations. A goggle properly designed for this class of protection need not embody any special shock resisting characteristics.

Frames

The frame of this goggle, like that for mechanical protection, must be comfortable and well ventilated. It must also be strong and, above all, must be light-tight, excluding all light except that passed through the lenses. The frame must be of the deep cut type that is of a cup depth sufficient to hold the lenses well away from the eye. It must be carefully ventilated to carry away any excess heat absorbed by the lenses.

Careful design and construction as to fit and ventilation are vital in the frame. There are many frames on the market, but very few embody all of the desirable features, and most of them entirely lack proper ventilation.

Lenses

The lenses in this goggle are of especial interest as these are the protective agencies. Considering the functions these lenses purpose, too much stress cannot be laid on their importance. Like the clear lenses of the mechanically protective goggle, they must also be optically good.

In the past, little or no attention has been paid by either the worker or the purchaser to the optical properties of lenses as affecting vision. They must be equally free from prism, astigmatism, optical defects, and bubbles, and must be of uniform density, to a degree required in clear lenses. Next comes the really vital feature of the lens. They are primarily used to protect the worker from the radiant energy produced by the industrial operation performed. In this function they must meet two definite ends. They reduce the visible light to a proportion to which the eye is naturally accommodated, and they filter out the harmful excessive invisible energy.

Very few people realize that in an electric arc for welding, only about 5 percent of the total radiant energy is visible. All of the energy is heat, including that which we see as light. In an arc, where the visible intensity is so great that we cannot bear to look at it, and where the brilliancy is only 5 percent of the total, it will be seen that the 95 percent of invisible energy, the ultra violet and infra red, must be filtered out to produce safe working conditions. In producing satisfactory glass for welding and kindred operations, it is comparatively easy to cut down the glare by darkening or coloring the glass. The ultra violet, comprising some 2 or 3 percent of the total, is also easy to eliminate almost completely, ordinary crown glass being fairly opaque to this energy and ample coloring of the glass acts to practically complete the exclusion of all useless and harmful visible and ultra violet energy. Having eliminated the ultra violet and cut the visible to workable proportions, very little attention was paid in the past to the 92 percent infra red energy, most of which passed through the glass.

Authorities do not agree on the detrimental effect of the infra red or the true heat rays on the eye. This is probably due to the fact that very little experimenting has been done in this field as compared to the ultra violet. It is, however, universally admitted that these rays are in no way useful to sight and will cause heating of the eyeball or flesh and can be dispensed with without being missed.

The production of a glass to cut off the infra red and energy is rather difficult, when certain visibility properties must be main-

**Extract from article in Safety Engineer by Chas. E. Fraser, Associate Material Engineer, U. S. Navy Yard, New York.*

tained. This it is believed as much as any other one feature has led to the disregard of the infra red protection. A short time ago, only one manufacturer marketed glass which really furnished full protection from all rays and this glass was rather expensive. Today, however, this type of glass can be had at costs far below that of the one former product, and the new glasses are actually better in protection value than the original one. The slowness of the development of a good protective glass was largely due to the lack of demand for it. Industrial concerns did not feel warranted in paying high prices for a possible protection when other glass, not furnishing this protection but approved under the National Safety Code, was far cheaper. However, education and specialization in the safety field are gradually producing their effect and the general realization is becoming prevalent that there is only one degree of safety, and that is safe or not safe, and there is being fostered a demand for full protection. The development of the new glass, however, is recent and not generally known among the purchasers. It is believed, however, that the demand for it will be general in the near future. The writer has followed the development of the welding glass rather closely for the past year and during this development many difficulties were met and overcome by those making the glass.

Practically all of the old glass was of a reddish brown color. In making the new glass an effort was made and successfully, to have the glass in a color, furnishing the greatest possible visibility with the least transmitted energy. It is an established fact that the light from the part of the spectrum giving the sensation of a sage green has the greatest activating value for retinual stimulus. The first action was, therefore, to produce a glass of this color.

If the glass is to be of any value, all color especially from the orange to the blue green must be transmitted in certain natural proportions, otherwise the glass will be color selective and the worker cannot clearly see his molten metal to gauge temperatures. The glass must, therefore, be non-color selective, highly transparent to yellow green energy in the visible and opaque or practically so to the energy below the indigo and above the red. The new glass transmits light of a color comparable to that of the Ives physical photometer, which is supposed to represent the color seen by the human eye when stimulated by white light. With a glass of this type, a very dense shade can be used, giving a high degree of protection, and the visibility is equal to that of a lighter shade of the old type brown glass. This works two ways. A very light shade will furnish protection equal to that of a denser shade of the brown glass, or a heavy shade will produce higher protection than an equally dense shade of the old glass and give equal visibility. There is no possible reason at the present day, either from cost standpoint, which should never have been considered anyway, or from ignorance of the requirements of true protection, why the industry should not protect its workers to the full extent in operations requiring protection from excessive intensity of radiant energy. The glass in these goggles can be had in various shades or density, dependent upon its function in the field. The density required can generally be determined by trying glasses of various density until the satisfactory shade is reached. Manufacturers of this glass are standardizing their shades to transmission values, thus no matter when purchased, all shade numbers will be equivalent in density. The United States Navy Specifications, recently published, are a good example of the effort of standardization. All shades from that of sun glasses with 50 percent visible transmission and only 16 percent total transmission, to a No. 14 shade with visible transmission in the fourth decimal place can be obtained.

Choice of Goggles Important

In the use of goggles for the radiant energy protection, there is a limit to their application. In the past, goggles have been used promiscuously for all operations, equipped with all shades up to No. 14. This practice is erroneous. The radiant energy from an operation requiring over a No. 6 shade is sufficient to severely burn and dry the skin of the face and neck, and no protection is furnished those parts by a goggle. Only in special cases where short exposure is necessary should a goggle be used where a No. 8 shade or denser is required to cut down the visible light. The hand shield or helmet equipped with proper glass and shade should always be used where a dense glass is required. The welding goggle, if properly used, need not be of a heat insulating frame type. Any temperature or energy radiations of sufficient intensity to heat a metal goggle frame to disagreeable temperature should be handled with a shield or helmet. Therefore, the choice of frame may be either metal or composition. This much can be said, however, in favor of the metal frame, for its weight it can be made stronger and generally cheaper, and it is a heat conductor and will tend to carry off the heat of the lenses by radiation. The lenses filter out the energy wholly by absorption, and therefore they become heated. This necessitates a deep cup holding the lens away from the eye. A shallow cup of the type used for chippers should never be used as a welding goggle as the lenses in the frame, if the goggle is properly designed for wide visual angle, are too close to the eye and the heat of the lens will be radiated to the eyeball. This will not necessarily cause any damage to the eye, but it will cause discomfort after a time. As to the angle of vision required in welding goggle design, this should be as great as possible but should not supersede other points. The vision when wearing this class of goggle is generally restricted to a small area while the operator is standing in one position, and while wide visual angle therefore is desirable it is not vital. Comfort, light, tightness, proper cup depth, and proper lens design are of prime importance.

In purchasing welding goggles, the buyer may hold the limit of optical perfection at the same degree as the clear clippers' lenses and apply the same testing methods. The determination of the filtering value and the visible light distribution can only be determined in a specially equipped laboratory and the writer would suggest recourse to the U. S. Bureau of Standard for these determinations. The procedure is to select a sample representing a certain quantity of material, deliver this to the Bureau of Standards in Washington, and request an energy analysis for transmission of ultra violet, visible, and infra red, the location of the peak of the visible energy curve, and the visible transmission. If the material is purchased under specifications, a copy of this specification can be forwarded requesting a test for compliance. In view of the fact that there is much material on the market of a mediocre quality, the writer believes the only safe course is to have a complete analysis made of samples of all material purchased unless the actual quality is definitely known by past tests. In purchasing this material the safest way is to thoroughly test, or have tested by a competent source, a sample of all material whose quality is not definitely known.

Finally in purchasing a welding goggle, the frame should be considered for comfort, strength, ventilation, light, tightness, and general workmanship. The lenses should be tested for value as to optical quality, filtering quality, visible density, effective visible color, non-color selective quality in the visible, uniformity of density, and the density match of the two eyes, which should be within 5 percent of each other. With these points standardized and carefully determined, a satisfactory standard of safety in industry as applied to physical protection of the eyes will be obtained.

WELDING FEATURED AT RAILWAY ELECTRICAL CONVENTION

At the meeting of the Association of Railway Electrical Engineers, which was held at the Hotel Sherman, Chicago, October 25-28, arc welding equipment was exhibited by the following concerns: General Electric Company, Westinghouse Electric and Manufacturing Company, E. A. Lundy Company, U. S. L. Battery Corporation, C. H. Hollup Corporation. The report of the electric welding committee gave particular attention to the subject of heat treament of welds and included a recommendation for information on acetylene welding to be included in the manual.

CHISHOLM-MOORE'S NEW MODEL K CYCLONE HOIST

The new Model K Cyclone Hoist, manufactured by The Chisholm Moore Mfg. Co., Cleveland, Ohio, makes its appearance this month.

The new hoist is constructed on the same gyrating yoke principle that is to be found in the previous Cyclone model hoist manufactured by the same company.

New engineering improvement, however, give the new hoist a working efficiency of 90 per cent as against 80 per cent for the previous Cyclone models and, according to statements of Chisholm-Moore officials, a length of life, without repairs, considerably longer than that of their old model.

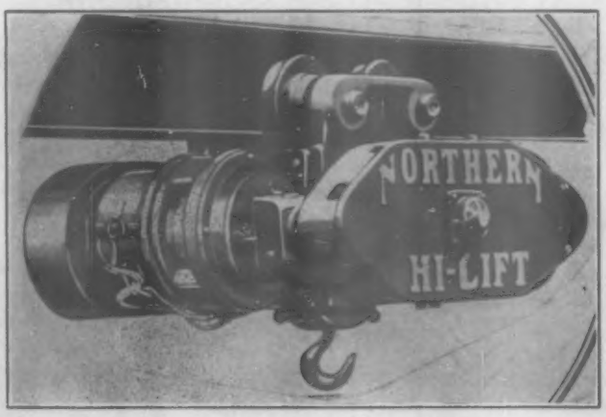
In a series of rigidly conducted tests, the new Model K Cyclone was operated continuously for a period of 320 hours. At the end of that period it was taken down and thoroughly inspected. It was found that no repair parts were needed and only slight wear was noted on the working parts. Considering that this test was the equivalent of lifting and lowering 38,400 one ton loads, the performance of the hoist becomes all the more remarkable.

Among the changes that made this record possible was the addition of anti-friction bearings at every rotating point. Altogether, eight ball bearings, four roller bearings and one Timken thrust roller bearing in the lower swivel hook help to increase the new hoist's efficiency.

One of the most important changes was made in the four eccentric roller bearings. In the old models the rollers in these bearings were loose and had to be carefully fitted into their cage at the time of assembling the hoist. In the new model K Cyclone these roller bearings are built in one complete unit which does away entirely with the loose rollers.

NEW SERIES-NORTHERN HI-LIFT HOIST

The Northern Engineering Works, main office and factory at Detroit, have recently added to their line of cranes and hoists a new series of Hi-Lift Hoists which, in both design and construction, as well as operation, is announced as a distinct stride forward in this field.



One of New Series of Hoists in Hi-Lift Line.

The new Hi-Lift is of compact design, rigid construction and besides ready accessibility and high efficiency in operation it features an exceptionally high hook lift, the advantages of which are appreciated by all users of such equipment especially those manufacturers having plants with low ceilings.

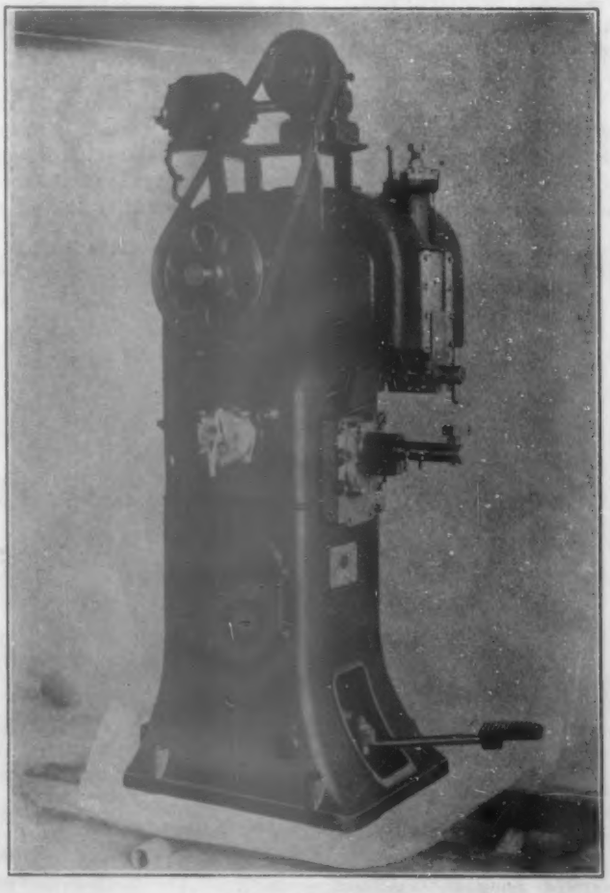
The makers report that many enthusiastic expressions have been received by the company from those who have inspected and tried this new equipment.

THE GIBB WELDING PRESS

The Welding Press, recently put on the market by the Gibb Welding Machines Co., Bay City, Mich., is a combination of an automatic spot welder and a punch press. It differs radically from an automatic spot welder in both construction and in results of operation.

An entirely new principle in spot welding is employed in that where spots are normally made in one second the Welding Press makes spots in one hundredth part of a second. This is accomplished by means of an especially designed transformer and a precisely timed automatic switch.

The transformer in its action has the characteristics of a condensor discharging its current with a lightning-like swiftness. The object of this new principle in spot welding, quite aside from speed of operation, is to make welds eliminating depressions in the surface, warpage, and discoloration. The weld is made before the heat has an opportunity to soften the outer surfaces of the sheet. It is claimed that welds can be made at the rate of two hundred or more spots per minute.



Gibb Welding Press.

The Welding Press has a smooth toggle action which quickly brings the welding points lightly into contact with the work and a final forging pressure which can be without limit. The usual hammering of copper points is absent. This smoothness of action not only insures long life to the moving parts but more particularly, together with the instantaneous heating, preserves the welding points, eliminating constant redressing with the consequent loss of production.

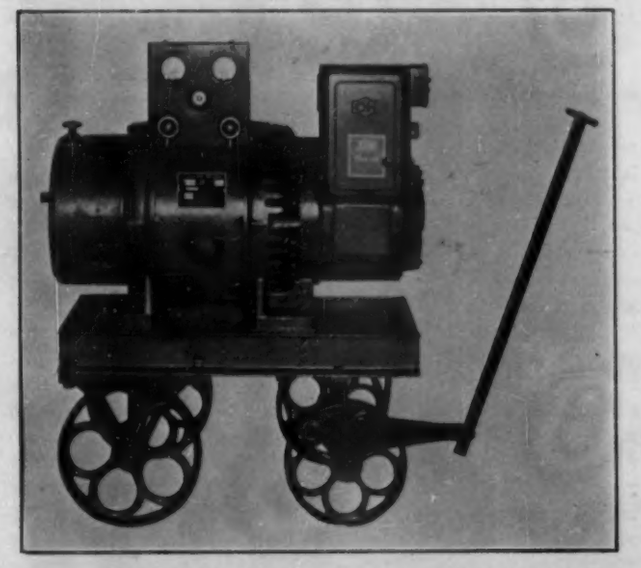
A particular field of application is in the more difficult and more precise welding of light to heavier parts. It is also adapted to finely polished surfaces where finish counts such as automobile bodies, auto parts, etc. Another special application is in welding spouts to bodies of oil cans, coffee

pots, tea kettles, etc. Another special application is in welding rivets, pins, or any shaped rods on ends to flat surfaces. An application of very wide scope is in attaching ears, clips, or lugs to containers. A special double acting Welding Press is here employed whereby two spots are made at one stroke. It can be used for welding hardware parts such as locks, catches, and so on where rivets are now used. It eliminates much of the uncertaintly in welding the non-ferrous metals such as brass and aluminium. Utensils of these metals need no longer be riveted.

NEW FUZON ARC WELDER

This most recent addition to the Fuzon Line of arc welders recently announced by the Fusion Welding Corporation, Chicago, is a direct current machine operated by a three phase a. c. motor, either 220 or 440 volts supply, both the welding generator and motor being mounted on the same shaft making a two bearing unit.

The remarkable feature of this welding generator is its unique arc. According to the manufacturers the arc is probably best described as "flexible" because it not only possesses unusual stability but responds so instantaneously to changes in arc length that it introduces a new arc quality which the



Fuzon Motor Driven Arc Welder on Hand Truck

operator using the machine seems best able to describe as "flexibility." For example, it is possible to instantly increase or decrease the arc length by a half inch without extinguishing it. This can be demonstrated in a spectacular way. Two pieces of half inch plate, three or four inches square, are placed several inches apart on top of a larger plate, and the layout connected to the welder ground wire. By using an ordinary metallic electrode and starting the arc on one of the plates, it can be swept across from plate to plate over the half inch drop in the center without breaking the arc. This means that the arc is lengthened a half inch as it goes down over one piece and shortened a half inch as it climbs up on the other piece. The electrode can be swept across from plate to plate, requiring the half inch increase and decrease in arc length, very rapidly and still not break the arc.

This remarkable flexibility is made possible because all of the auxiliary apparatus usually incorporated in an arc welding unit has been eliminated. The welder has no external stabilizer, no field rheostat and no separate exciter. When the auxiliaries are eliminated, it is claimed that the arc responds instantly to all fluctuations.

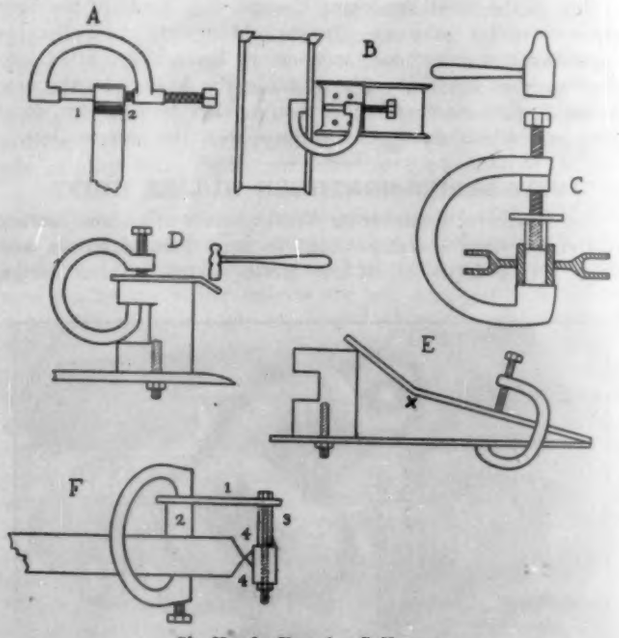
The elimination of the auxiliaries also reduces the weight and at the same time permits very rugged construction. The fact that there is but one control to govern the welding current and that this control is accomplished, not by means of rheostats, but by a simple brush shifting device, gives the new welder a very wide range. The current can be varied from 50 amperes to 300 amperes and, over this range, the arc is said to be equally flexible and stable. This is due to the fact that shifting the brushes not only controls the current going to the operator but, at the same time, and by the same control, alters the volt-ampere characteristic of the machine in such a manner that the most suitable characteristic is supplied at each current to which the machine is set. This permits welding metals from the thinnest to the thickest with equal facility by merely setting the current at the desired amperage.

MANY USES FOR THE "C" CLAMP

An efficiently operated welding shop in Albany, New York, has provided its welders with 50 "C" service clamps in a wide range of sizes, because of the multitude of uses to which this simple device can be put. Here are a few examples of ways in which a C-clamp can be used to save time and effort:

A. The clamp is used here to press out a spring bushing without removing the spring from the automobile. (1) is a piece of tubing, (2) is a nut. Turning the clamp screw forces the bushing out of the spring and into the tubing.

B. After erection on a 20-story building it was discovered that the angle bracket on an I-beam was bent, but on account of the position it could not be hammered back with a sledge. A line



Six Handy Uses for C-Clamps.

was heated on the angle with the oxy-acetylene torch, while a helper drew it into place with the clamp.

C. Forcing a bronze bushing into a cable sheave.

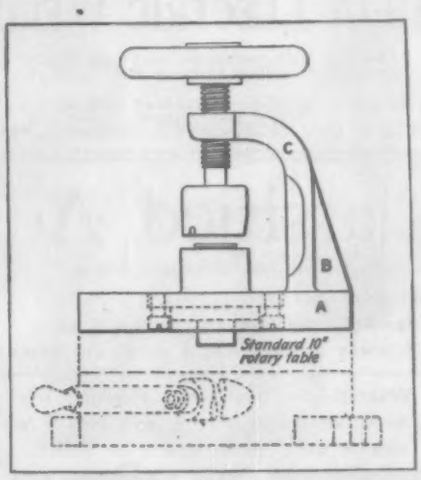
D. With the C-clamp a ½"x⅜" piece of steel is held to a block of iron bolted to the bench. The line of bend is heated with the torch and given a sharp, square bend with the hammer.

E. To restore a bend on this derrick bracket, it was simply heated on a line at "X," and using the clamp as shown saved a lot of work.

F. A heavy cast iron piece from a planer, with the bearing broken off the end, was veed out for welding, the plate (1) held to the iron block with a C-clamp, while a piece of pipe (3) supported the bearing, leaving ample room to use the torch in welding.

WELDED STEEL VS. CAST-IRON JIGS AND FIXTURES

Regarding the use of welded steel shapes, instead of castings, in the fabrication of jigs and fixtures, a correspondent in the American Machinist says that "Fabrication by welding has the following advantages: Increased strength; reduced weight and space; quicker fabrication; and reduced cost. In almost any jig or fixture that might be contemplated, at least one of these factors is of prime importance. Within the last month we had occasion to redesign a fixture used for milling the lips



of air-brake hose couplings, and turned to the welded steel construction because it was the easiest way to obtain the required structural rigidity, and because it was imperative that it be available for us as quickly as possible. We were not disappointed."

The sketch illustrates this fixture. The circular plate A and the brazine web B were burned with a torch from commercial plate, and the goose-neck C was cut and bent from standard bar stock. The three parts were welded together and machined by ordinary processes.

TELLS CHICAGO SECTION ABOUT STELLITE

At the November meeting of the American Welding Society, Chicago Section, held Friday evening, November 4th, Mr. W. E. Becker of the Haynes Stellite Company read a paper on the subject of "Stelliting Metal Parts." This paper described Stellite and gave some interesting data regarding its properties, with particular reference to the fact that economies in the use of Stellite usually are shown in the longer life of the parts Stellited. The speaker described the difference between applications of Stellite with the torch and the ordinary welding practices; then gave several examples of jobs which have shown remarkable savings. The meeting was well attended and following the paper there was a long discussion of the possibilities of using Stellite in a great variety of jobs.

NEW SMITH TORCH HAS UNIQUE TIP

The Smith Welding Equipment Corporation, Minneapolis, Minnesota, recently introduced an innovation in oxy-acetylene torch construction. The Smith welding torches are now furnished with an insulated tip. The tip is made with an inside and outside wall and these two walls are separated by insulating material which prevents overheating of gases when the outside of the tip gets hot. A circular has been prepared giving illustrations and full information regarding this new type of construction.

NEWS OF THE WELDING TRADE

The Goodman Electric Machinery Company of Newark, N. J., who deal in rebuilt electric welding machinery, are at the present time on the market to buy any quantity of used welding machines of all types and sizes.

The Lincoln Electric Company announce the transfer of Mr. R. P. Nick from the Baltimore, Maryland, office to the Lancaster, Pennsylvania, office, where he will be in charge of the sale of "Linc-Weld" Motors and "Stable-Arc" Welders.

At the meeting of the International Railway General Foremen's Association, held in Chicago September 6th, Mr. George T. Boone, General Foreman of the Canadian National Railways, read a paper on the reclamation work of the railroad, showing that welding is an important factor in keeping down locomotive costs.

C. W. Obert, who has been secretary of the Boiler Code Committee of the A. S. M. E. for sixteen years, recently resigned to accept a position with the Union Carbide and Carbon Research Laboratories, Long Island City, New York.

R. D. Thomas Company, of Philadelphia and New York, have just announced that in addition to handling Westinghouse arc welders and Gibb spot and seam welders they have recently taken on the distribution of the Swift butt welders.

The Wickwire Spencer Steel Company, Inc., voluntarily went into receivership under date of October 22nd. Mr. Edward C. Bowers and Mr. Charles L. Feldman were appointed receivers by the Court. Mr. Bowers has been president of the corporation for the past two years. His appointment has assured the retention of the present organization and all plants will be operated as before without shutting down. There will be no rearrangement of the selling organization in any respect The American Wire Fabrics Corporation, a subsidiary of the Wickwire Spencer Steel Company is not in the receivership and is in no way affected by the proceedings.

At the regular October meeting of the Victorian Institute of Welding Engineers, Australia, the feature of the evening was a lecture by Mr. D. Hay entitled "Welding Practices in the Victorian Railways."

Craftsweld Equipment Company, formerly located at 570 Seventh Avenue, New York City, recently moved to new quarters at 250 West Fifty-fourth Street and announce that at their new address they are equipped for better service and improved shop facilities.

A new one-story addition providing 4,000 additional feet of floor space is about to be erected by the Eastern Welding and Radiator Company, 417 South Fifth Street, Baltimore, Maryland.

E. J. Cipperly, welding specialist for the General Electric Company, read a paper entitled "Arc Welding in the Field" before the meeting of the Los Angeles Section of the American Welding Society, which was held on October 27th. There was also a film shown which illustrated the welding of household water heaters.

Announcement has been received from the Lincoln Electric Company of the appointment of Mr. E. H. Thornwell of Atlanta, Georgia, as their representative for Georgia and eastern Tennessee. Mr. Thornwell has been actively associated with the electric industry in Atlanta and Pittsburgh for

"STANDARD"
Welding Wire
GAS AND ELECTRIC
A grade for each type of work—send for samples.

for sound permanent welds : : lower costs
Our costs are considerably under those of large industrial centers; ours is a one-profit wire sold direct to user from our own mills exclusively devoted to making of welding wire from raw material to finished product—hence our extremely low prices for wire that is definitely superior. Adopted exclusively by many large users.
Prices on request.
Standard Steel & Wire Co., Greensburg, Pa. (Mills at Bolivar, Pa.)

over twenty years. He will be assisted by Mr. J. Van Horn, factory engineer of the Lincoln Electric Company.

It is reported that the Modern Boiler and Welding Works, which was recently incorporated at Ponca City, Oklahoma, opened a machine shop at Bowlegs, Oklahoma, in the Seminole Oil Fields. The shop is in charge of D. E. Randolph and J. J. Ryker.

Announcement has been made that the Linde Air Products Company, of New York City, are planning the erection of a new plant at Erie, Pennsylvania.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of THE WELDING ENGINEER, published monthly at Chicago, Illinois, for October 1st, 1927.
State of Illinois, County of Cook, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared H. S. Card, who, having been duly sworn according to law, deposes and says that he is the Business Manager of THE WELDING ENGINEER, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, G. H. Mackenzie, Chicago, Illinois.
Editor, H. S. Card, Chicago, Illinois.
Managing Editor, H. S. Card, Chicago, Illinois.
Business Manager, H. S. Card, Chicago, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)
The Welding Engineer Publishing Co., 608 S. Dearborn St., Chicago, Ill.
G. H. Mackenzie, 7115 Luella Ave., Chicago, Illinois.
M. J. Hungerford, 7115 Luella Ave., Chicago, Illinois.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is. (This information is required from daily publications only.)

H. S. CARD,
Business Manager.

Sworn to and subscribed before me this 28th day of Sept., 1927.
(Seal) William Derzbach.
(My commission expires April 7, 1929.)

REBUILT ELECTRIC WELDERS
We buy, sell, exchange, rent and repair:
Arc Welders, Spot Welders, Butt Welders
Take advantage of our specialized welding service.
GOODMAN ELECTRIC MACHINERY CO., 126 Green St., Newark, N. J.

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Other Ads—$1.00 per line, minimum 4 lines.
Counted 8 words to line. Add 6 words for keyed address

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Position Wanted—Experienced boiler maker and gas and electric welder; railroad work preferred; good references. Address Box 132, care The Welding Engineer.

Position Wanted—Electric arc welder with ten years' experience in one shop, desires a change. 45 years old. Married. Address C. H. Sherwood, 67 W. Cardott St., Ridgeway, Pa.

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AMERICAN STEEL ENGINEERING COMPANY
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601 Granite Bldg., Pittsburgh

GE Arc Welders, GE Electrodes: TYPES A, B and F
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Write to nearest office for descriptive circular and prices

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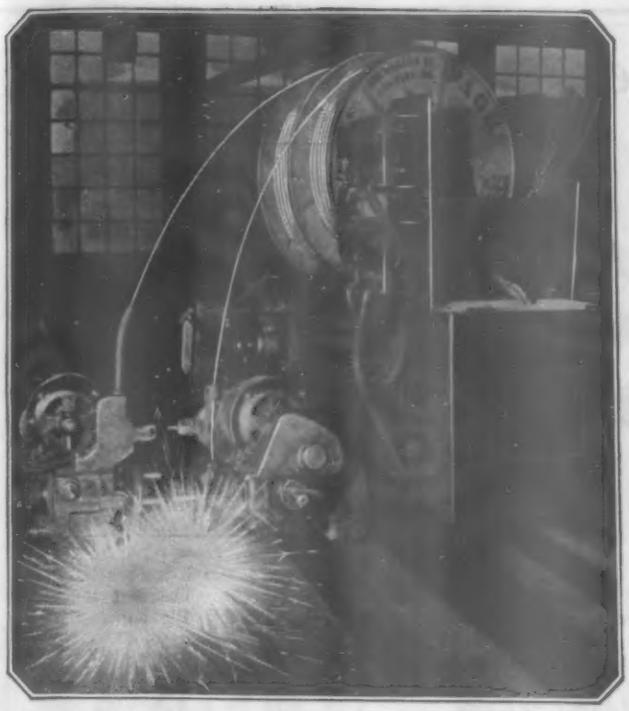

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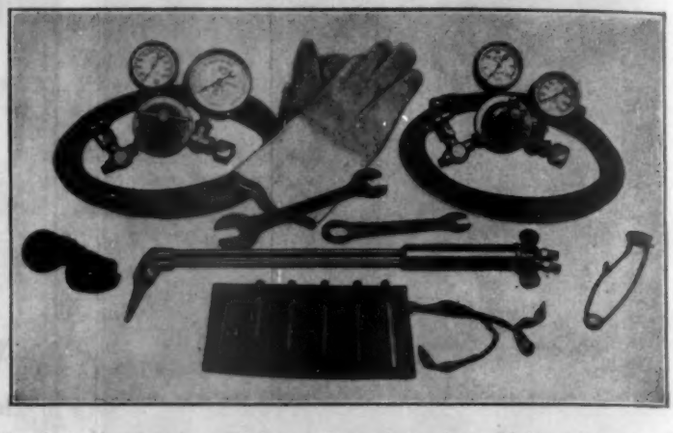

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has been designed to give the welder a maximum of comfort and protection embodied in the extreme lightness of weight, proper ventilation and the absolute exclusion of all outside light.

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is made throughout of special vulcanized fibre of exceptional strength and wearing qualities. This shield carries the CESCO indorsement; your assurance that the degree of quality and workmanship is of the highest.

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Complete with ESSENTIALITE Lens
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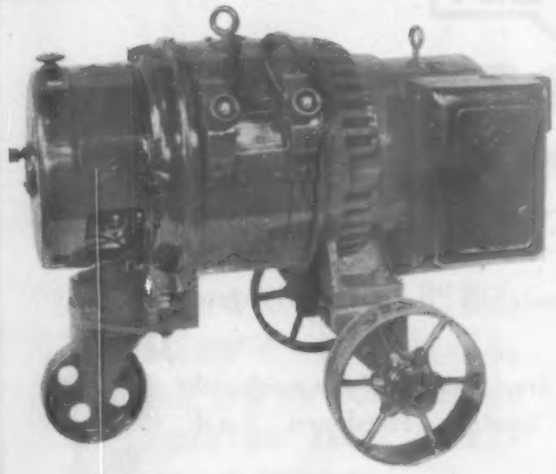

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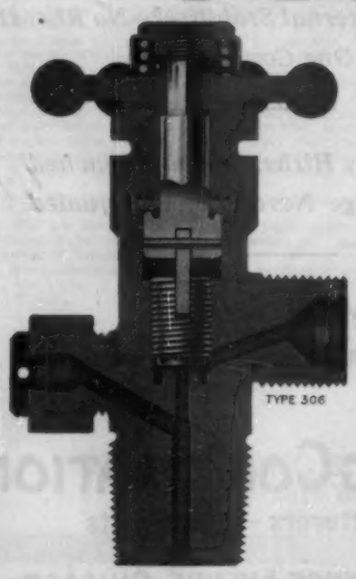

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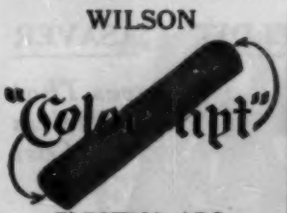

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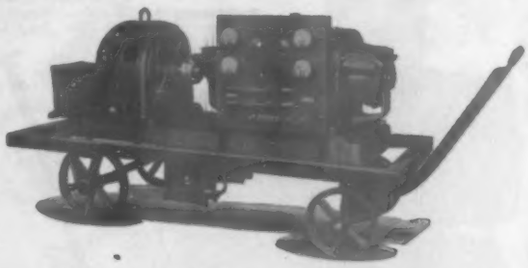

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Willson No. 200

For all kinds of electric welding. Equipped with Willson-Weld Glass, —cuts out over 99% of the injurious rays. Prevents distorted vision and sandy eyes. No. 200 helmet complete, $12.60, f. o. b. any Willson distributor, or from

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1827— ONE HUNDREDTH ANNIVERSARY —1927

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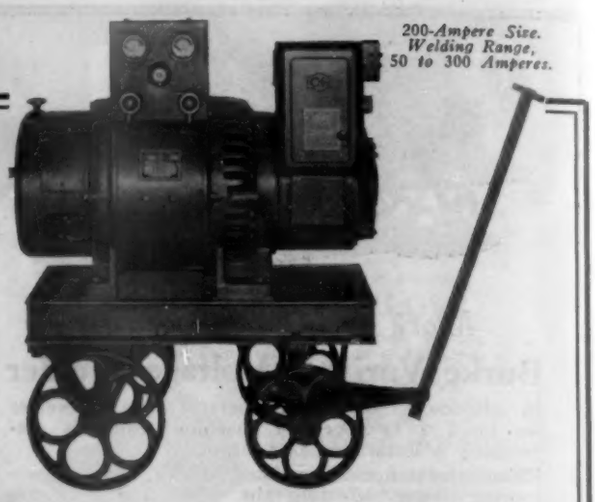

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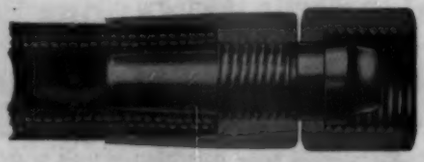

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In the making of stabilators six welds are made to join the cover and drum. It is obvious that a considerable saving in time and cost would be made if all these welds were made simultaneously by the projection method in which a number of welds are made at each closing of the electrodes. In this method small points or projections are formed of a uniform size on a punch press on the surface of one part where the welds are to be, as shown fig. 3.

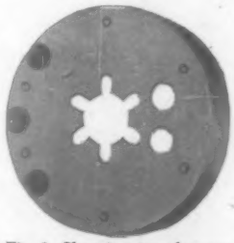

Fig. 3—Showing punch press projections which locate spot welds

For this development a standard Thompson 75 PA single spot welder was utilized, and the lower electrode was replaced by a table upon which 6 dies were mounted and which, actuated by a Geneva movement, rotates a sixth of a revolution at the end of each welding cycle.

Dies of various grades of copper were tried and proved to be the weak link in the development on account of being too soft, because after a few welds the projections on the material made impressions in the dies which increased rapidly in size and spread the current away from the weld, resulting in poor quality welds.

Fig. 2—Dark spots show 6 welds made simultaneously

Elkonite, the new electrode material finally gave the satisfactory results; this, on account of the fact that it is a combination of tungsten and copper, having a Brinnel hardness of 225 as compared with 82 for hard copper, and a compressive strength of 208,000 lbs. per sq. in., while that of hard copper is only 58,000 lbs. It is these inherent qualities of ***Elkonite*** which made the Watson experiment successful and increased production possible.

Heretofore copper dies produced but 50 completed pieces, ***Elkonite*** however produces 5000 and more before resurfacing becomes necessary, and ***Elkonite*** can be resurfaced at least 3 times.

The *Elkonite* dies are designed so that they may be removed readily, duplicate sets are provided and changes are made on regular schedule, thus minimizing die failure during operation and its consequent loss in production, and work thrown out. The machine welds at the rate of 16 pieces per minute, nearly 1000 per hour, each piece containing six separate uniform welds made simultaneously, as shown fig. 2. This machine has now been in service several months.

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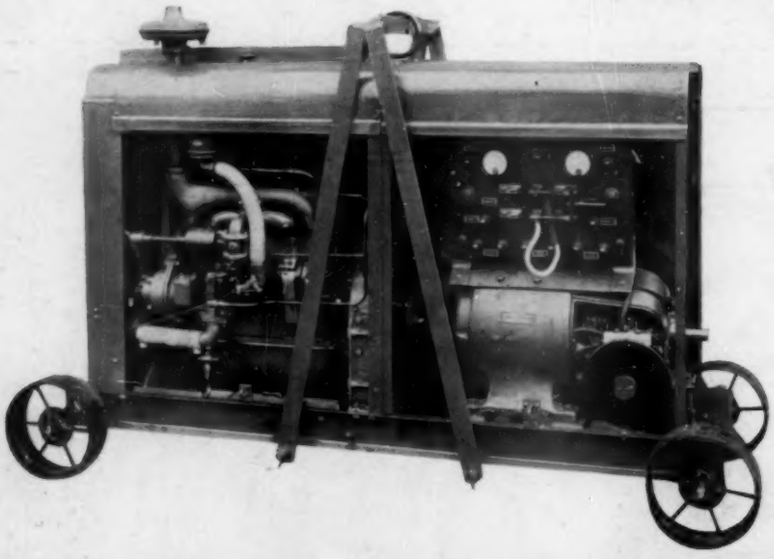

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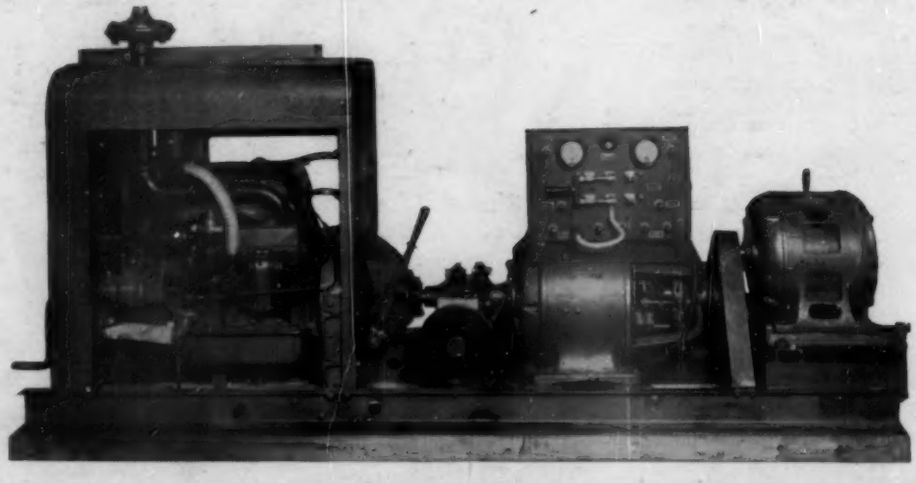

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